

# **Case-control Study of Childhood Cancers in Dover Township (Ocean County), New Jersey**

## **Interim Report**

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Division of Epidemiology, Environmental and Occupational Health  
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In cooperation with

Agency for Toxic Substances and Disease Registry  
U.S. Department of Health and Human Services

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# **Case-control Study of Childhood Cancers in Dover Township (Ocean County), New Jersey**

## **Interim Report**

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## EXECUTIVE SUMMARY

In 1995, at the request of the federal Agency for Toxic Substances and Disease Registry (ATSDR), the New Jersey Department of Health and Senior Services (NJDHSS) evaluated the occurrence of childhood cancer in Dover Township and found that the incidence was significantly higher than expected. Consequently, the NJDHSS and ATSDR developed a Public Health Response Plan (PHRP) detailing a systematic process to investigate childhood cancer in Dover Township. The PHRP's purpose was twofold: 1) to update and validate information on childhood cancer in Dover Township; and 2) to evaluate possible environmental exposure pathways so as to generate hypotheses.

In 1997, NJDHSS and ATSDR decided to design and conduct an epidemiologic study. The overall purpose of this exploratory epidemiologic study is to identify possible disease risk factors that might explain the elevated rates of selected childhood cancers in Dover Township. This will be accomplished by evaluating the magnitude of associations between these selected cancers and various factors.

The study uses a case-control design to identify possible risk factors and the magnitude of their association with childhood cancers in Dover Township. A case-control study design was selected because it is the best method for studying rare diseases. The study has two separate components: an **Interview Study** and a **Birth Records Study**. The **Interview Study** focuses on childhood cancer cases (leukemia and nervous system cancers) diagnosed from 1979 through 1996 while the child was living in Dover Township. The cancer cases are then compared to four controls per case with respect to information collected using a structured parental interview. The **Birth Records Study** compares all births from 1966 through 1996 among residents of Dover Township to cancer registries in ten states, including New Jersey, to identify children diagnosed with any type of cancer. The cases are then compared to ten controls per case with respect to information contained on the birth certificate.

This Interim Report evaluates the association between childhood cancer and the following risk factor groups:

- 1) demographic, pregnancy and birth characteristics;
- 2) family medical history;
- 3) health, medical conditions and medical procedures;
- 4) dietary factors;
- 5) exposure to tobacco smoke and alcohol; and
- 6) household-related exposures: chemicals, animals and household appliance electromagnetic fields.

Additional possible risk factors will be discussed in the Final Report of the study, including exposures to specific community and private drinking water sources, air pollution sources, proximity to hazardous sites, and parental occupation.

### **Interview Study Methods and Results**

A case was defined as a child who was diagnosed with leukemia or nervous system cancer before 20 years of age while residing in Dover Township. Cases were identified from New Jersey State Cancer Registry records from 1979 through 1996. Four controls were matched to each case by age, gender, and residence in Dover Township at the time the case was diagnosed. Controls were identified from Toms River School District student rosters. A structured questionnaire was developed and administered over the telephone by experienced NJDHSS interviewers. Information was collected from one year prior to birth to the month and year of the case's diagnosis. Collected questionnaire information includes demographic, residential, occupational, pregnancy, medical, and environmental exposure histories. A few interviewed parents were required to recall information back as early as 1962.

The relative risk (odds ratio) of childhood cancers was computed using conditional logistic regression to evaluate the degree to which exposure factors were associated with disease. The 95% confidence interval was calculated to assess the precision of the measure of statistical association. Odds ratios (OR) were computed for two age groups (children diagnosed prior to age 20 and children diagnosed prior to age five) for each of four cancer groupings: leukemia and nervous system cancers (all cases); leukemia alone; all nervous system cancers; and brain and central nervous system cancers. An odds ratio greater than one for an exposure factor means that the exposure factor was more common in cases than controls. Conversely, an odds ratio less than one means that the exposure factor was less common in cases than controls.

Interviews were conducted for a total of 40 children (22 with leukemia and 18 with nervous system cancers) who met the case definition and 159 controls. The overall study participation rate was 83.6% (100% of cases and 80% of controls). There were no interviews for 39 potentially eligible controls, primarily due to parent refusals and lack of response after repeated contact attempts. Using information from birth certificates, the participating and nonparticipating controls were generally similar for average weight at birth, race, and maternal age at the time of child's birth. Nonparticipating controls were found to have been born earlier in the study time period, resided less frequently in Dover Township at the time of the child's birth, and were less likely to be the mother's first born child than the participating controls.

**Demographic, Pregnancy and Birth Characteristics:** Mother's and father's educational levels showed no clear pattern among the odds ratios, ranging

from 0 to 5.9. Higher paternal education (some college or higher) was negatively associated with leukemia (OR=0.2) while higher maternal education some (college or higher) was positively associated with nervous system cancer (OR=5.9). A significantly elevated odds ratio for leukemia and nervous system cancers combined in younger children was found for children in larger families (mothers with four or more total live births, OR=3.6), which appeared to be due to the higher incidence in younger children diagnosed with leukemia (OR=3.9).

**Family Medical History:** Risk factors evaluated in this group included reported cancer history in the child's biological relatives and sibling history of inherited diseases or birth defects. Most of the variables in this risk group had very low prevalence of positive responses. A history of any type of cancer in the parents of a child was elevated for nervous system cancers (OR=7.3), although this association was not statistically significant. The elevated risk appears to be due to the influence of the sympathetic nervous system cases since the odds ratio for a history of any type of cancer in the parents of a child was not elevated for brain and central nervous system cancers (OR=1.3).

**Health, Medical Conditions and Medical Procedures:** A child's use of antibiotics (ten days or longer) was positively associated with cancer incidence (ORs=2.4 to 4.4). Exposure to diagnostic x-rays during childhood was positively associated with cancer incidence (ORs=4.7 to 9.4). Since x-rays could be part of a medical evaluation prior to diagnosis, re-analysis after removing x-rays received within one year of the diagnosis date resulted in odds ratios that were substantially lower and not statistically significant (ORs=1.4 to 2.2).

**Dietary Factors:** Variables in this risk group displayed wide fluctuations in odds ratio magnitudes. Prenatal dietary variables tended to display odds ratios below 1.0 while the postnatal dietary variable odds ratios tended to be more inconsistent. Odds ratios for a mother's use of multivitamins during pregnancy were below 1.0 for all age and cancer groupings, and was negatively associated with leukemia incidence (ORs=0.1 to 0.2). Odds ratios for mothers who ate cured meats (including hot dogs, bacon, ham, sausage, and lunch meat) weekly during pregnancy were significantly lower for cancer incidence (ORs=0.1 to 0.4). Odds ratios for children who ate cured meat once or more per week were significantly lower for brain and central nervous system cancer (ORs=0.1 to 0.2). The odds ratio for mothers who drank more than four glasses of tap water or drinks made from tap water per day during pregnancy was elevated for leukemia (OR=3.4).

**Exposure to Tobacco Smoke and Alcohol:** This risk factor group consisted of variables of relatively low prevalence and odds ratios of moderate variability. None of the risk factors in this category were statistically significant or very noteworthy.

**Household-related exposures (chemicals, animals, and appliance electromagnetic fields):** Use of fingernail polish or remover in the home during childhood was negatively associated with leukemia (OR=0.4). A child's regular use of an electric blanket, electric mattress pad, or heated water bed was positively associated with leukemia (OR=12), however, the prevalence of exposure was very low.

### **Birth Records Study Methods and Results**

A case was defined as a child who was diagnosed with any type of cancer before 20 years of age and whose mother was a resident of Dover Township at the time of the child's birth. All births from 1966 through 1996 among residents of Dover Township, identified from New Jersey Vital Statistics records, were compared to the New Jersey State Cancer Registry records, 1979 through 1996, and nine other state cancer registries. Cancer cases were then matched to ten controls by year of birth and gender. The cases were then each compared to their ten matched controls with respect to variables contained on the birth certificate. Data analysis was similar to the Interview Study. Odds ratios (OR) were computed for two age groups (children diagnosed prior to age 20 and children diagnosed prior to age five) for each of five cancer groupings: leukemia and nervous system cancers (all cases); leukemia alone; all nervous system cancers; brain and central nervous system cancers, and all other cancers.

A total of 528 children were enrolled in the Birth Records Study (48 cases and 480 controls). Of the 48 cases, 41 were residents of Dover Township when diagnosed with cancer, five of the cases resided in another Ocean County community, one resided in another New Jersey county, and one resided in another state at the time of their diagnoses. Of the 41 cases who were residents of Dover Township both at birth and diagnosis, 24 were diagnosed with leukemia or nervous system cancer, and thus were also included in the Interview Study.

As in the Interview Study, odds ratios varied considerably due to slight fluctuations in the numbers of exposed subjects. Since all information was derived from the birth certificate, only demographic, pregnancy and birth characteristic risk factors could be examined.

**Demographic, Pregnancy and Birth Characteristics:** Odds ratios for being the first live birth of the mother were nearly all below 1.0. Being first born was negatively associated with all cancers combined (OR=0.4) and all other cancers combined (OR=0.2). Odds ratios for high birth weight (4000+ grams) were nearly all above 1.0, with leukemia in children diagnosed prior to age five significantly elevated (OR=5.7). Less than adequate prenatal care utilization was positively associated with leukemia (ORs=3.8 and 16.) and negatively associated with nervous

system cancers (OR=0.1). Mother's and father's educational level displayed mixed odds ratios with low maternal education (less than 12 years) significantly associated with leukemia in younger children (OR=8.3). The odds ratio for any complications of pregnancy with the child was elevated for brain and central nervous system cancer in children diagnosed under age five (OR=6.7) and positively associated with nervous system cancers in children diagnosed under age five (OR=4.9). The types of pregnancy complications indicated on the birth certificate varied substantially and provided no clear insight into the meaning of these results.

## **Discussion**

The results found in this report should be interpreted cautiously and in conjunction with existing biological and epidemiologic knowledge. Due to the relatively small number of subjects in each study, the statistical analyses are very sensitive to slight fluctuations in the numbers, which can result in substantial swings in the odds ratios. As a consequence, several sizable, but imprecise associations (as noted by the wide confidence intervals) were found as might be expected in a study of limited size.

In the Birth Records Study, the odds ratio for high birth weight (4000+ grams) was positively associated with leukemia (OR=5.7). The Interview Study found an elevated odds ratio for higher birth weight and leukemia diagnosed in younger children, although this was not a statistically significant finding (OR=2.7). The published literature on birth weight and childhood cancer is contradictory.

A child's use of antibiotics (ten days or longer) was elevated for all age and cancer groupings and significantly elevated for leukemia and nervous system cancers combined. There is one report in the published literature indicating that the use of certain antibiotics is associated with childhood cancer.

Diagnostic x-ray exposure during pregnancy was elevated for leukemia though not statistically significantly (ORs=2.8 to 4.0). Many of the odds ratios for a child's exposure to diagnostic x-rays after birth were found to be positively associated with leukemia and nervous system cancers. Because of concerns that diagnostic x-rays could be part of the medical evaluation of a case prior to his or her diagnosis, a child's exposure to diagnostic x-rays was also evaluated by eliminating from the analysis those x-rays received within one year of the end of the relevant time period (i.e., the date of the case's cancer diagnosis). The resulting odds ratios were substantially lower and none were statistically significant (ORs=1.4 to 2.2). Diagnostic x-rays during pregnancy (at least in earlier decades) have been identified as a risk factor for childhood cancer in the medical literature, however, postnatal exposure to diagnostic x-rays has not been identified as a risk factor for childhood cancer.



Low odds ratios were found for a mother's use of multivitamin supplements during pregnancy for all age and cancer groups evaluated. A mother's use of multivitamin supplements during pregnancy was found to be negatively associated with the cancers studied, particularly for leukemia. The literature indicates that use of multivitamins reduces the risk of childhood brain tumors.

The prenatal and postnatal cured meat dietary variables (including hot dogs, bacon, ham, sausage, and lunch meats) displayed wide variations in the odds ratio magnitudes. Many of the prenatal cured meat variables exhibited negative associations with cancer incidence. The negative associations detected are inconsistent with published studies that suggest that these foods are potential risk factors for childhood cancer, especially brain tumors. Odds ratios for postnatal cured meat consumption tended to be more mixed with nearly equal numbers above and below 1.0.

Prenatal and postnatal tap water consumption odds ratios did not display any consistent pattern. While higher maternal consumption (more than four glasses per day) of tap water during pregnancy was positively associated with leukemia incidence, odds ratios for nervous system cancers and brain and central nervous system cancers were mostly below 1.0. Odds ratios for a child's consumption of tap water were mainly above 1.0. However, it is important to note that this report does not examine the source of drinking water (Dover Township public water by well field; private wells in Dover Township; or water from outside of Dover Township). The Final Report will include more detailed assessments of water source and their relationship to cancer incidence.

Odds ratios for both prenatal and postnatal regular use of an electric blanket, electric mattress pad, or heated water bed (household appliance EMF exposure) showed wide confidence intervals. Although a child's regular use of these appliances was positively associated with leukemia, usage of these items was not highly prevalent in the study population. Some scientists suggest that exposure to EMFs can cause childhood leukemia, while others argue that the data are still inconclusive.

The data found in this report need to be interpreted cautiously since no adjustments for confounding have been completed. The complete analysis of the Interview Study and Birth Records Study will be available in the Final Report, which is expected to be released in the latter part of the year 2000. Multivariate analysis will be performed to determine which variables show stable associations with disease risk when potential confounding is controlled. The Final Report will include the complete analysis of the risk factors presented in the Interim Report, as well as the analysis of parental occupational data, proximity to hazardous sites, and the environmental risk factors based on the historic modeling of public water and air pollution sources which are currently being developed at ATSDR and the Environmental and Occupational Health Sciences Institute (a joint program of Rutgers University and the University of

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## **INTRODUCTION**

During the years 1979 to 1995, the incidence of childhood cancers was elevated in Dover Township (Ocean County), New Jersey. This Interim Report describes, in part, results of an exploratory epidemiologic study conducted by the New Jersey Department of Health and Senior Services (NJDHSS) and the federal Agency for Toxic Substances and Disease Registry (ATSDR) to investigate possible reasons for the elevation in cancer incidence rates. Specifically, this report provides the results of analyses conducted to investigate the following factors:

- < demographic, pregnancy and birth characteristics
- < family medical history
- < health, medical conditions and medical procedures
- < dietary factors
- < exposure to tobacco smoke and alcohol
- < household-related exposures: chemicals, animals and household appliance electromagnetic fields

A complete report of this exploratory epidemiologic study, including all results regarding environmental exposure assessments, air and public drinking water modeling, proximity to hazardous sites, and parental occupation will be released in the latter part of the year 2000.

## **Background**

In 1996, the NJDHSS and ATSDR developed a Public Health Response Plan (PHRP) detailing the course of action the agencies would follow to investigate childhood cancer in Dover Township (NJDHSS and ATSDR, 1996). The PHRP set forth

a systematic process to evaluate childhood cancer incidence in Dover Township and to generate hypotheses about possible causes. The PHRP was developed in coordination with the Citizens Action Committee on Childhood Cancer Cluster (CACCCC).

The PHRP included an updated childhood cancer incidence analysis, and evaluations of potential environmental exposures in relation to two National Priorities List hazardous waste sites in Dover Township: Ciba-Geigy (in progress) and Reich Farm (NJDHSS and ATSDR, 1999a), as well as the Dover Township Municipal Landfill (NJDHSS and ATSDR, 1999b). In addition, the NJDHSS and the New Jersey Department of Environmental Protection (NJDEP) conducted an extensive water quality evaluation of the United Water Toms River community water supply serving much of the township (NJDHSS, NJDEP, and ATSDR, 1999). Epidemiologic evaluations of exposure pathways related to the hazardous waste sites and the community water supply are still being analyzed and therefore not described in this Interim Report, but will be presented in the Final Report.

### **Childhood Cancer Incidence in Dover Township**

As part of the PHRP, the NJDHSS analyzed cancer incidence statistics for the period 1979 to 1995 (Berry and Haltmeier, 1997). All childhood (0-19 years of age) cancers combined and groupings of selected childhood cancer types were evaluated for Ocean County, Dover Township, and the Toms River section of the Township. Variations in the rates of childhood cancers over time for each study area were also evaluated.

The results of the Childhood Cancer Incidence Health Consultation confirmed that overall cancer incidence was elevated in Dover Township (Standardized Incidence Ratio [SIR] = 1.3, 95% Confidence Interval [CI] = 1.1-1.7) and the Toms River section of the Township (SIR = 1.7, 95% CI = 1.1-2.5). The elevations were specifically noted among female children under age five in Toms River for acute lymphocytic leukemia (SIR = 4.3, 95% CI = 1.2-11) and for brain and CNS cancer



(SIR = 11.6, 95% CI = 2.3-34). Although case counts fluctuated from year to year, the time trend analysis provided limited evidence that the rates in Dover Township tended to be higher than expected during the mid to late 1980's.

### **Occurrence and Diversity of Childhood Cancers**

In New Jersey, an average of 14.3 new cases of cancer per 100,000 children under the age of 15 years occurred each year in the period 1979 through 1995. In comparison, the estimated annual rate in the United States was 13.6 cases per 100,000 children in a similar time period. Leukemias are the most common type of cancer that occur in children under age 15, accounting for 31% of cancers in New Jersey in this age group. Brain and central nervous system cancers account for 20% of new childhood cancer cases, and sympathetic nervous system cancers account for 7.5% of new cancer cases in children under age 15 (NJDHSS, 1999).

Nationally, the overall incidence of childhood cancers has increased since the mid-1970's, but rates in the past decade have been fairly stable (Ries et al., 1999; NCI, 1996; Zahm and Devesa, 1995). Childhood leukemia incidence has continued to increase over this same time period, with the trend primarily reflecting an increase in acute lymphocytic leukemia. Childhood brain and central nervous system cancers appear to have increased over the past two decades (Ries et al., 1999). The increases may be due to diagnostic improvements that have occurred over the past 20 years, better case ascertainment, or may reflect real increases in incidence due to unknown factors. Over the past two decades, there has been little indication of an increase in the overall incidence of sympathetic nervous system cancers (Ries et al., 1999).

Survival rates for many types of childhood cancer have been improving in recent years due to advances in diagnosis and treatment. In New Jersey, cancer mortality rates have been dropping steadily, from 4.2 deaths per 100,000 children under age 15 in 1980 to 3.0 per 100,000 in 1994 (NJDHSS, 1999). Cancer,

however, remains the second leading cause of death among children under age 15 years.

### **Literature Review of Potential Risk Factors Evaluated in Interim Report**

The following discussion focuses on categories of childhood cancer risk factors evaluated in this Interim Report. Further information on these risk factors may be found in the following comprehensive reviews: Sandler and Ross, 1997; Chow et al., 1996; Pritchard-Jones, 1996; Zahm and Devesa, 1995; Ross et al., 1994; Kuijten and Bunin, 1993; and Greenberg and Schuster, 1985.

**Demographic, Pregnancy and Birth Characteristics:** Data on the relationship between socioeconomic status and childhood cancer has generally found that while children of higher socioeconomic class are at increased risk for leukemia, the relationship between socioeconomic status and other childhood cancers is inconclusive (Chow et al., 1996). The positive association of older maternal age (age 35 or older) at birth with childhood leukemia is well established by multiple studies. A positive association of older paternal age with childhood brain cancer is less well established (Hemminki et al., 1999). Data on the relationship between birth order, history of miscarriage, and birth weight with childhood brain cancer and leukemia are contradictory (Chow et al., 1996).

**Family Medical History:** For the more common childhood cancer types, known heritable factors do not appear to play a strong causal role in most children with cancer, but the identification of such factors remains an active area of research. For two rarer childhood cancer types (retinoblastoma and Wilms= tumor), heritable factors have been identified as important risk factors. Certain genetic syndromes increase the risk of childhood leukemia and/or brain cancer (Pritchard-Jones, 1996). These genetic syndromes include Down=s syndrome, Bloom=s syndrome, neurofibromatosis, Li-Fraumeni syndrome and ataxia telangiectasia. Some studies have found increased occurrence of cancer in relatives of children with leukemia and

brain cancer, indicating possible familial genetic susceptibility to cancer or a common shared environmental exposure, but other studies have not found this positive association (Chow et al., 1996).

**Health, Medical Conditions and Procedures:** While prenatal exposure to medications could be associated with increased childhood cancer risk, there is contradictory or insufficient evidence that any substances other than diethylstilbestrol (DES) are risk factors. Maternal use of DES during pregnancy was associated with a risk of rare vaginal adenocarcinomas in the daughters (Herbst et al., 1971). Barbiturate use (during pregnancy and childhood) and maternal use of anti-nausea medication have been associated with increased risk of childhood cancers in some studies, but not in others (Kuijten and Bunin, 1993). Positive associations between childhood barbiturate exposures and brain tumors are especially difficult to interpret because these medications may be used to treat early manifestations of disease.

Some studies have shown a small increase of childhood leukemia after prenatal low-dose irradiation (Zahm and Devesa, 1995). X-ray exposure during childhood for a variety of therapeutic purposes has also been associated with increased risk of cancers (Greenberg and Schuster, 1985). Risk from this exposure source has been substantially lowered in the past few decades because of lower radiation doses and less frequent use of x-rays during pregnancy and therapy.

**Dietary Factors:** N-nitroso precursor compounds, which are found in cured meats, induce brain tumors in experimental animals. Consumption of cured or processed meats by the child or by the mother during pregnancy has been associated in some studies but not in others with increased risk of childhood brain cancer or leukemias (Preston-Martin et al., 1996c; Peters et al., 1994; Sarasua and Savitz, 1994; Bunin et al., 1993 ). Use of multivitamins and high consumption of fruits and vegetables during pregnancy have been reported to reduce the risk of childhood brain tumors (Preston-Martin et al., 1998, Bunin et al., 1993).

**Tobacco Smoke and Alcohol Use:** There is little evidence that maternal

smoking during pregnancy increases the risk of leukemia in children (Shu et al., 1996; Klebanoff et al., 1996; Zahm and Devesa, 1995). There is some evidence that paternal smoking during the preconception period may be associated with the risk of childhood cancer, particularly leukemia (Ji et al., 1997; Shu et al., 1996). There is little evidence that parental smoking is a risk factor for childhood brain cancer (Gold et al., 1993; Norman et al., 1996). Maternal alcohol consumption has been associated with certain forms of myeloid leukemia (Severson et al., 1993).

**Household-related Exposures: Chemicals, Animals and Electromagnetic Fields (EMFs):** Increased risk of childhood brain tumors and leukemias has been reported in relation to home insecticide use and parental agricultural occupations. While no specific chemical has been identified as a risk factor, studies have identified usage of termiticides, pest strips, flea collars, insecticides, and herbicides as possible concerns (Pogoda and Preston-Martin, 1997; Zahm and Ward, 1998).

There has been considerable speculation regarding possible viral causes of childhood cancers, particularly leukemias, but there is no epidemiologic evidence suggesting risk related to specific organisms. Increased risk of childhood cancer has been observed among children in contact with farm animals, and presumably, animal viruses (Holly et al., 1998; Bunin et al., 1994). Greaves (1988) has suggested that leukemias may result from spontaneous mutation in B-cells and subsequent proliferation in response to an infectious agent. Kinlen (1991) has theorized that mixing of previously isolated populations may increase childhood leukemia risk due to introduction of unidentified infectious agents.

Increased risk of childhood leukemia, brain cancer, or other childhood cancers has been found in some studies of exposure to residential electromagnetic fields (Wertheimer and Leeper, 1979; Savitz et al., 1988; NRC, 1997; NIEHS, 1998). However, several recent large-scale studies have shown small to no increases in risk (Linnet et al., 1997; Preston-Martin et al., 1996b; Gurney et al., 1996; McBride et al.,

1999). Leukemia and brain cancer incidence has also been associated in some studies with prenatal and postnatal household appliance use, such as electric blankets which are a source of sustained electromagnetic fields, while in other studies no association has been found (Preston-Martin et al., 1996a; Gurney et al., 1996; Hatch et al., 1998; London et al., 1991; Savitz et al., 1990). The inconsistency of findings among the studies on residential electromagnetic fields, and uncertainty as to the proper way to measure exposure, makes the interpretation of this body of literature difficult and inconclusive.

### **Study Objectives**

The overall purpose of this exploratory epidemiologic study is to identify possible disease risk factors that might explain the elevated rates of select childhood cancers in Dover Township by evaluating the magnitude of associations between these select cancers and various factors. The study uses a case-control study design where children with cancer are compared to children without cancer to assess the differences in histories of exposure to risk factors. This study focuses on two age groups, children diagnosed before 20 years of age and children who were diagnosed before age five. These age groups contain the excess rates of cancer previously found for Dover Township.

This Interim Report evaluates the association between childhood cancer and potential risk factors previously described. Additional risk factors, including exposures to specific community and private drinking water sources, air pollution sources, proximity to hazardous sites, and parental occupation, will be presented in the Final Report of the study, which is expected to be released in the year 2000.

### **Study Design Overview**

The Dover Township childhood cancer epidemiologic study is an exploratory investigation which consists of two separate case-control components. A case-control

study format was selected because it is the best method for studying rare diseases (Schlesselman, 1982). The **Interview Study** focuses on childhood cancer cases diagnosed while resident in Dover Township, and matched comparison (control) children. Cases were identified through the New Jersey State Cancer Registry. Matched controls were identified primarily through public school records. The Interview Study collected information through structured questionnaire-based telephone interviews of parents of case and control children. Four controls were selected for each case in order to increase study power.

The **Birth Records Study** is designed to look at childhood cancer cases whose mothers lived in Dover Township at the time of the case's birth but who were diagnosed with cancer in either Dover Township or elsewhere. Cases in the Birth Records Study were identified through the New Jersey State Cancer Registry and cancer registries in other states, through record linkage to New Jersey Vital Statistics and Registration. Control children in the Birth Records Study were identified from birth records. The Birth Records Study analyzed information available from birth certificates. Ten controls were selected for each case in order to increase study power.

## **INTERVIEW STUDY**

### **Interview Study Methods**

**Geographic Area of Study:** The geographic area for the Interview Study is Dover Township, Ocean County, New Jersey. Cases and controls were required to have resided within Dover Township in a specified period of time at a designated point in life, as described below.

**Case Definition:** A case is defined as a child who: 1) was diagnosed with leukemia or nervous system cancer; 2) was under age 20 at the time of his or her diagnosis; 3) was diagnosed between January 1, 1979 and December 31, 1996; and 4) was a resident of Dover Township at the time of diagnosis.

**Case Recruitment:** Cases were identified through the New Jersey State Cancer Registry. After case parents were located (see Search Methods section), parents of eligible cases were contacted by mail through a letter introducing the study and inviting participation, with follow-up telephone contact as necessary. Once the appropriate informed consent was obtained, a telephone interview was scheduled and completed with the child's mother. Fathers were interviewed to provide their own occupational histories. Mothers were asked to provide paternal occupational information only when fathers were not available. When mothers were not available for interview, the interview was completed with the child's father.

**Control Definition:** Four controls were selected for each case child and matched to the case as described below. A control was defined as a child who was: 1) a resident of Dover Township during the month and year of the matched case's cancer diagnosis; 2) the same gender as the matched case, and 3) the same age (" 1 year) as the matched case.

**Control Recruitment:** Public school records were used for the identification of potential controls. Based on the 1990 U.S. Census, 93.2% of the school-aged

children (grades 1 through 12) in Dover Township attended public school. Controls were randomly selected from lists of all Dover Township children attending the Toms River School District within the same school grade during the year the case was diagnosed. Information on a potential control child's name, address, date of birth, and grade level was abstracted from school records. School records of the students on the list of potential controls were examined to determine if the child met the age, gender, and residence matching criteria. Controls who were determined not to meet the control definition were replaced by the next random selection until the appropriate criteria were met.

For cases who were diagnosed before school age, controls were selected from among those children entering first grade six years after the birth year of the case, with the additional requirement that the control was also living in Dover Township in the month and year the case child was diagnosed. For two recently diagnosed case children who were still younger than school age by the end of 1996, controls were randomly selected from certificates of Dover Township births in the birth year of the case.

After parents of eligible controls were located (see Search Methods section), contact and interviewing proceeded in the same way as noted above for the cases.

**Search Methods:** NJDHSS staff attempted to locate all case and control families based on information held in the New Jersey State Cancer Registry and the Toms River School District records, supplemented by electronic address databases located on the Internet. For case and control families whose location could not be verified by NJDHSS, New Jersey State Library staff assisted in searching a national credit file and the New Jersey Public Record File. An ATSDR contractor with extensive locating experience was also used for difficult-to-locate families.

**Data Collection:** A questionnaire was developed to gather information on possible risk factors and confounding variables. Collected information included: identifying and demographic data; residential history of mother and child; parental



educational and occupational histories; family medical history (including cancer); pregnancy history of mother (including medical and exposure information during pregnancy with child); and child's medical and environmental exposure history. The questionnaire was field-tested prior to use.

**Relevant Time Period:** A relevant time period for data collection, consisting of two time frames, was constructed for each case: 1) from one year prior to the birth of the child up to the birth; and 2) from birth through the month of diagnosis with cancer. For matched controls, the relevant time period was constructed to begin one year prior to their own birth, and end in the month of diagnosis of their matched case.

**Factors Analyzed/Discussed in Current Report:** The following information, collected by questionnaire, will be discussed in this Interim Report.

- < **Demographic, pregnancy and birth characteristics.** Proportion of the child's life spent in Dover Township; mother's age; parental education; mother's previous pregnancy losses and terminations; child's birth weight and birth order; complications of pregnancy; delivery method; and congenital malformations or other abnormal conditions of the newborn.
- < **Family medical history.** Cancer history in child's biological relatives (siblings, parents, and grandparents) and sibling history of inherited diseases or birth defects.
- < **Health, medical conditions and procedures.** Diagnoses of specific infections, other illnesses, or complications during mother's pregnancy; maternal use of antibiotics and steroids during pregnancy and breast-feeding; birth defects of child; mother's exposure to dental x-rays and exposure to diagnostic x-rays by frequency and body area irradiated during pregnancy; child's specific infections and major illnesses from birth to the end of the relevant period; child's immunization history; child's exposure to dental x-rays and exposure to diagnostic x-rays by

frequency and body area irradiated.

- < **Dietary factors.** Usual intake of cured meats (hot dogs, lunch meat, bacon, ham or sausage), fresh fruit or vegetables, multivitamins and tap water by the mother during pregnancy and by the child from birth to the end of the relevant period.
- < **Exposure to tobacco smoke and alcohol.** Mother's smoking frequency (cigarettes per day) and duration during pregnancy; total average smoking frequency by others in the household during pregnancy; child's exposure to smoking in the household from the child's birth to the end of the relevant period; mother's alcohol consumption (weekly servings of wine, beer or mixed drinks) during pregnancy.
- < **Household-related exposures: chemicals, animals and electromagnetic fields.** Mother's (during pregnancy) and child's (from birth to the end of the relevant period) exposure to household and garden chemicals (including pesticides and herbicides); mother's and child's use of electric blankets and heated water beds (household appliance electromagnetic fields); the child's exposure to household pets, farm animals, and geese or ducks.

**Analytic Methods:** The relative risk of childhood cancers was computed for each of the exposure assessment variables using a logistic model (Schlesselman, 1982). Exposure odds ratios (ORs) were computed for four cancer groups using matched analyses (conditional logistic regression). The cancer groups were: leukemia and nervous system cancers (all cases); leukemia alone; all nervous system cancers; and brain and central nervous system cancers. The study subjects were divided into two age groups within each of the four cancer groupings: children diagnosed prior to age 20 and children diagnosed prior to age five. Confidence intervals (95%) were computed to indicate the precision of the OR estimates.

Participation rates were tabulated for eligible cases and potentially eligible

controls. Nonparticipation of potential study subjects was characterized by reason. The distributions of various risk factor characteristics of cases and controls were tabulated without respect to matching. These risk factor groups were: demographic, pregnancy and birth characteristics; family medical history; health, medical conditions and medical procedures; dietary factors; exposure to tobacco smoke and alcohol; and household-related exposures: chemicals, animals and electromagnetic fields.

Additional possible risk factors, including estimated exposures to specific community and private drinking water sources, air pollution sources, proximity to hazardous sites, and parental occupation, will be discussed in the Final Report of the study.

Statistical analyses included calculation of descriptive statistics and univariate analysis designed to assess the relationship between exposure to individual potential risk factors and case-control status. Some exposure variables were collected as continuous measures (for example: birth weight, gestational age, and number of cigarettes smoked). These variables were categorized for analysis. For variables examined in other epidemiologic studies of childhood cancer, cut-points for categorization of variables were based on values commonly used in previously published scientific literature (for example: birth weight and maternal age). For other variables, cut-points were chosen based on the distribution of values among controls. Generally, attempts were made to establish tertiles of approximately equal numbers of controls, unless there were obvious natural distributional breaks which dictated other choices.

Conditional logistic regression odds ratios for matched sets were computed using the Stata 6 statistical software `Aclogit` procedure (StataCorp, 1999) for each level of categorized exposure variable. In conditional logistic analysis the case and their matched controls are grouped and a conditional likelihood is calculated based on the groups. The precision of the odds ratio estimates was expressed using the 95% confidence interval, which was used as a measure of statistical significance.

Odds ratios (and their 95% confidence intervals) in risk factor groups were graphed for leukemia and brain and central nervous system cancers diagnosed in all ages combined. Only those exposure factors with a minimum of two cases in the exposed or unexposed categories were graphed.

## **Interview Study Results**

A total of 42 children were identified by the New Jersey State Cancer Registry with a diagnosis of leukemia or nervous system cancer while residing in Dover Township in the period 1979 through 1996. After initial contact with the families, however, it was determined that two of these children resided in other municipalities at the time of their diagnosis, leaving a total of 40 children that met the study's case definition. All eligible case families consented to participate in the study (Table 1).

Table 2 presents the age of diagnosis and cancer type of the 40 eligible cases. Leukemia accounted for 22 of the cases (55.0%), while sympathetic nervous system cancer accounted for five cases (12.5%) and brain and central nervous system cancer accounted for 13 cases (32.5%).

Out of 238 potential control families that NJDHSS attempted to recruit for the interview study, 40 children were determined to be ineligible as control subjects. Of the 198 remaining families, 159 were eventually interviewed (Table 1). Four matched controls were interviewed for all cases except one, for whom three controls were interviewed. The control participation rate was 80.3% (159/198). Of the 39 potentially eligible controls who were not interviewed, parent refusals (19) and no response after repeated contact attempts (12) were the primary reasons for not being interviewed. Seven potential control families could not be located and the parents of one potential control child were either deceased or severely disabled.

A total of 199 subject families (40 cases and 159 controls) were interviewed and constitute the entire interview case and control study population. The overall study participation rate was 83.6%. Of the four originally selected controls per case,

all four of those originally selected were interviewed for 18 of the cases, three of the initial controls were interviewed for 16 of the cases, and two of the initial controls were interviewed for six of the cases. None of the cases had less than two of the initially selected controls interviewed.

Characteristics of the study interviews are presented in Table 3. All but one of the interviews were conducted by telephone. Two NJDHSS interviewers conducted nearly all of the interviews with each doing half of the case families, and 57% and 42% respectively of the control families. One control family interview was conducted by a third NJDHSS interviewer. Birth mothers were interviewed for the mother's section of the questionnaire in 95.0% of the case families and 93.1% of the control families. Case and control birth fathers were interviewed for the father's section of the questionnaire 62.5% and 57.9% respectively, while case and control birth mothers were interviewed for the father's section 32.5% and 39.6% respectively. The informant's cooperation and the quality of information were subjectively judged by the interviewers to be similar regardless of case or control status, with 98.6% of the interviews rated as good/dependable or better.

**Demographic, Pregnancy and Birth Characteristics:** Table 4 presents demographic, pregnancy, and birth characteristics of the study population. There were an equal number of male and female cases, 20 each. Virtually the entire study population was white and non-Hispanic. The plurality of the cases and controls were similar with 95.0% and 95.6% singleton births, respectively. The period 1980-84 contained the most case births, 14 or 35.0% of all cases in the Interview Study, and the period 1987-90 contained the most case diagnoses, 12 or 30.0%. More case mothers resided in Dover Township during part or all of their pregnancy with their offspring (62.5%) compared with control mothers (51.5%). The percent of life lived in Dover Township as measured by residential address, from birth to the end of the relevant period, was similar for case and control children. Cases (77.5%) attended day care, camps, and/or schools more frequently than controls (67.9%). The average

number of study months was similar by case and control group (109.1 months vs. 109.8 months).

The birth mother's average age at time of the child's birth was similar for case (26.8 years) and control (27.1 years) groups. Case birth mothers tended to have slightly more education (25.0% had at least a college degree) than control birth mothers (18.3% had at least a college degree), whereas, control birth fathers had slightly more education (32.1% had at least a college degree) than case birth fathers (22.5% had at least a college degree).

Pregnancy histories for study children were similar for both the case and control groups. Slightly more control children were first born children (41.5%) than case children (35.0%). Pregnancy duration and rate of Caesarean section deliveries did not differ by case or control group. Average birth weight for cases (3,499 grams) was slightly higher than for controls (3,352 grams).

Tables 5a through 5d present the conditional logistic regression odds ratios for demographic, pregnancy, and birth characteristics by cancer group (leukemia and nervous system cancers; leukemia; nervous system cancers; and brain and central nervous system cancers) and age group at diagnosis (ages 0 through 19; and ages 0 through 4).

Mother's and father's educational levels displayed considerably mixed odds ratios, ranging from 0 to 5.89. High paternal education (some college or higher) was negatively associated with leukemia for all ages combined (OR=0.20; 95% CI=0.05, 0.76) while high maternal education (some college or higher) was positively associated with nervous system cancers in children diagnosed before age five (OR=5.89; 95% CI=1.07, 32.4).

Children in larger families (mothers with four or more total live births) had a significantly elevated odds ratio for leukemia and nervous system cancers combined for the younger age group (OR=3.63; 95% CI=1.08, 12.2), which appeared to be driven by the incidence in children diagnosed with leukemia (OR=3.94; 95%

CI=0.85, 18.2).

Figures 1a and 1b present the graphed odds ratios for demographic, pregnancy, and birth characteristics by leukemia in all ages and brain and central nervous system cancers in all ages. Exposure variables evaluated in this risk factor group display odds ratios both above and below 1.0 between cancer groupings, and wide confidence intervals (lack of precision).

**Family Medical History:** Table 6 presents self reported information on family medical history of cancer and inherited health problems or birth defects. The frequencies of reported inherited problems or birth defects in study children or their siblings were similar for both case and control groups. The self reported responses were reviewed by staff of the New Jersey Birth Defects Registry to provide guidance on conditions that should be considered a likely birth defect. Both case and control groups were similar in the frequency of likely birth defects for study children and their siblings.

Family history of any type of cancer and brain cancer was similar for cases and controls. Family history of leukemia was higher for case families (5.0%) than control families (1.3%). History of any type of cancer in grandparents was similar for case and control groups, but history of any type of cancer in parents was higher in case families (10.0%) than control families (5.0%). No cancer was reported in any study child's siblings.

Tables 7a through 7d present the conditional logistic regression odds ratios for family medical history by cancer group (leukemia and nervous system cancers; leukemia; nervous system cancers; and brain and central nervous system cancers) and age group at diagnosis (ages 0 through 19; and ages 0 through 4). None of the odds ratios for family history of cancer, inherited health problems, or birth defects indicated a significant association with cancer incidence. Although not statistically significant, a history of any type of cancer in parents was elevated among children with nervous system cancers (OR=7.29; 95% CI=0.66, 80.8) based on few positive

responses. This appears to be driven by the sympathetic nervous system cases since the odds ratio for a history of any type of cancer was much lower in the parents of a children with brain and central nervous system cancers (OR=1.26).

Figures 2a and 2b present the graphed odds ratios for family medical history variables by leukemia in all ages and brain and central nervous system cancers in all ages. Since many exposure variables evaluated in this risk factor group had a relatively low positive response rate, few exposure factors could be graphically depicted, especially for brain and central nervous system cancers. Those factors presented appear to be distributed around 1.0 with no obvious pattern of elevation or decrease in risk.

**Health, Medical Conditions and Medical Procedures:** Table 8 presents information on health, medical conditions, and medical procedures as reported by parents. No mothers reported having measles, rubella, chickenpox, or cytomegalovirus during pregnancy with the study child. The frequency of most prenatal medical conditions and medical procedures was similar for cases and controls. Vaginal or uterine bleeding, and toxemia or pre-eclampsia during pregnancy were slightly higher in control mothers (11.9% and 5.0%) than case mothers (7.5% and 2.5%). Nausea and vomiting for more than three months during pregnancy was higher for case mothers (12.5%) than control mothers (6.9%). Maternal exposure to dental x-rays during pregnancy was higher among controls (28.9%) than cases (22.5%), while diagnostic x-rays or radiation therapy was higher among case mothers (12.5%) than control mothers (5.7%). Of the 14 mothers who had diagnostic x-rays while pregnant, 13 mothers (5 cases and 8 controls) had a single x-ray and one mother (1 control) had two x-rays.

The frequencies of most postnatal medical conditions and medical procedures were similar for cases and controls. Controls tended to have slightly higher immunization rates for infectious diseases, increased measles infections, and were more likely to have used an IV tube immediately after delivery. Cases had higher



rates of antibiotic use for ten days or more. Cases had higher rates of other major illnesses (40.0%), excluding reports of the index case diagnosis, than controls (27.0%). Exposure to dental x-rays was higher in controls (52.8%) than cases (47.5%), while diagnostic x-rays or radiation therapy was higher in cases (37.5%) than controls (25.8%). Of the 56 children who received a diagnostic x-ray or radiation therapy, 91.0% (14 cases and 37 controls) had no more than two exposures and no child had more than four exposures. It appears from the interview responses that the reported diagnostic x-rays or radiation therapy exposures were diagnostic x-rays and not radiation therapy, based on the infrequency of exposure and the lack of illnesses reported that are treated with radiation. Consequently, the exposure factor diagnostic x-rays or radiation therapy will be referred to as x-rays.

Tables 9a through 9d present the conditional logistic regression odds ratios for health, medical conditions, and medical procedures by cancer group (leukemia and nervous system cancers; leukemia; nervous system cancers; and brain and central nervous system cancers) and age group at diagnosis (ages 0 through 19; and ages 0 through 4). Antibiotic use for ten days or longer by a child was elevated for all age and cancer groupings and significantly positively associated with leukemia and nervous system cancers for all children and all ages combined (OR=2.37; 95% CI=1.02, 5.54) and all children diagnosed prior to age five (OR=4.35; 95% CI=1.17, 16.1).

Exposure of the child to diagnostic x-rays was positively associated with leukemia and nervous system cancers for all children diagnosed prior to age five (OR=4.67; 95% CI=1.49, 14.6) and nervous system cancers in children diagnosed prior to age five (OR=6.64; 95% CI=1.19, 36.9). Although receiving diagnostic x-rays more than once was not associated with any cancer grouping, a single diagnostic x-ray was positively associated with leukemia and nervous system cancers for all children diagnosed prior to age five (OR=5.13; 95% CI=1.40, 18.8) and with leukemia for all children diagnosed prior to age five (OR=9.43; 95% CI=1.02, 87.4).

In order to evaluate the possible differences in exposure to x-ray intensity over time, diagnostic x-rays were stratified by those occurring prior to 1985 and those occurring from 1985 onward. The pre-1985 exposure of the child to diagnostic x-rays were positively associated with leukemia and nervous system cancers for all children diagnosed prior to age five (OR=5.93; 95% CI=1.02, 34.6). From 1985 onward, exposure of the child to diagnostic x-rays remained elevated, but not statistically significant for leukemia and nervous system cancers.

Because of concerns that diagnostic x-rays could be part of the medical evaluation of a case prior to his or her diagnosis, a child's exposure to diagnostic x-rays was also evaluated by eliminating from the analysis those x-rays received within one year of the end of the relevant time period (i.e., the date of cancer diagnosis). The resulting odds ratios were substantially lower and none were statistically significant. The odds ratio for diagnostic x-rays for leukemia and nervous system cancers for all children diagnosed prior to age five was reduced from 4.67 to 1.36 (95% CI=0.28, 6.7.) and for nervous system cancers in children diagnosed prior to age five it was reduced from 6.64 to 0. The odds ratio for a single diagnostic x-ray for leukemia and nervous system cancers in all children diagnosed prior to age five was reduced from 5.13 to 1.75 (95% CI=0.34, 9.05) and for leukemia in all children diagnosed prior to age five it was reduced from 9.43 to 2.24 (95% CI=0.39, 13.0).

Figures 3a through 3d present the graphed odds ratios for health, medical conditions, and medical procedures exposure variables by leukemia in all ages and brain and central nervous system cancers in all ages. The factors presented for this risk factor group appear to be randomly distributed around 1.0 with no obvious pattern, and wide confidence intervals (lack of precision) for the postnatal factors.

**Dietary Factors:** Table 10 presents prenatal and postnatal dietary information. Mother's cured meat consumption during pregnancy is defined as: consumption of either bacon, ham, or sausage; hot dogs; or lunch meat. In the following discussion, the term weekly refers to consumption of a specific dietary factor

one or more times per week.

During pregnancy, control mothers reported higher rates than case mothers for a number of dietary exposures, including: any hot dog consumption (79.3% versus 67.5%); weekly hot dog consumption (20.8% versus 7.5%); weekly consumption of bacon, ham, or sausage (39.6 versus 12.5%); any consumption of lunch meats (86.2% versus 80.0%); weekly consumption of lunch meats (64.2% versus 45.0%); weekly cured meat consumption (76.1% versus 55.0%); and multivitamin supplementation for five days or more (80.5% versus 62.5%). Most case and control mothers reported drinking tap water or drinks made from tap water during pregnancy, 92.5% and 93.1% respectively. Postnatal dietary exposures were generally similar for cases and controls. Among control children, 88.7% were reported to drink tap water or drinks made with tap water versus 95.0% of case children. Source of tap water (Dover Township public water, private wells, or other water systems) are not considered in these prenatal and postnatal tap water consumption variables.

Tables 11a through 11d present the conditional logistic regression odds ratios for dietary factors by cancer group (leukemia and nervous system cancers; leukemia; nervous system cancers; and brain and central nervous system cancer) and age group at diagnosis (ages 0 through 19; and ages 0 through 4). The dietary factors risk group displayed wide fluctuations in odds ratio magnitudes. Generally, prenatal dietary variables tended to display odds ratios below 1.0 while the postnatal dietary variable odds ratios tended to be more inconsistent.

For all study children combined, odds ratios found to be negatively associated with leukemia and nervous system cancers include: mother's weekly consumption of lunch meat during pregnancy (OR=0.44; 95% CI=0.22, 0.91); mother's weekly consumption of bacon, ham, or sausage during pregnancy (OR=0.21; 95% CI=0.08, 0.57); mother's weekly consumption of cured meat during pregnancy (OR=0.34; 95% CI=0.16, 0.74); and mother's use of multivitamin supplements for five or more

days during pregnancy (OR=0.38; 95% CI=0.16, 0.89). In all children diagnosed under age five, mother's use of multivitamin supplements for five or more days during pregnancy (OR=0.20; 95% CI=0.05, 0.86), mother's weekly dietary consumption of lunch meat during pregnancy (OR=0.30; 95% CI=0.10, 0.93) and mother's weekly consumption of cured meat during pregnancy (OR=0.24; 95% CI=0.07, 0.85) were also negatively associated with leukemia and nervous system cancers.

Mother's consumption of any hot dogs during pregnancy (OR=0.30; 95% CI=0.10, 0.90) and mother's use of multivitamin supplements for five or more days during pregnancy (OR=0.23; 95% CI=0.07, 0.73) were negatively associated with leukemia for all ages combined. More than four glasses of tap water or drinks made from tap water per day during pregnancy was positively associated with leukemia for all ages combined (OR=3.43; 95% CI=1.18, 10.0). Mother's use of multivitamin supplements for five or more days during pregnancy (OR=0.06; 95% CI=0.01, 0.57) was negatively associated with leukemia in children diagnosed prior to age five.

Mother's weekly consumption of bacon, ham, or sausage during pregnancy (OR=0.15; 95% CI=0.03, 0.72) and mother's weekly consumption of cured meat during pregnancy (OR=0.27; 95% CI=0.08, 0.88) were both negatively associated with nervous system cancers for all age groups. Child's consumption of lunch meat one or more times per week was negatively associated with nervous system cancers for all age groups (OR=0.08; 95% CI=0.01, 0.76).

Mother's weekly consumption of bacon, ham, or sausage during pregnancy was negatively associated with brain and central nervous system cancers for all ages combined (OR=0.08; 95% CI=0.01, 0.65). Child's consumption of lunch meat one or more times per week (OR=0.08; 95% CI=0.01, 0.79) and child's consumption of cured meat twice or more per week (OR=0.22; 95% CI=0.06, 0.79) were negatively associated with brain and central nervous system cancers for all age groups.

Figures 4a through 4d present the graphed odds ratios for dietary factors by

leukemia in all ages and brain and central nervous system cancers in all ages. Prenatal dietary factors presented are primarily below 1.0 for both leukemia, and brain and central nervous system cancers. Odds ratios for higher maternal tap water consumption during pregnancy are over 1.0 for leukemia and below 1.0 for brain and central nervous system cancers. Postnatal dietary factors appear to be distributed around 1.0 with no obvious pattern of reporting, and wide confidence intervals (lack of precision) for brain and central nervous system cancers.

**Exposure to Tobacco Smoke and Alcohol:** Table 12 presents information on prenatal tobacco smoke and alcohol exposure and postnatal tobacco smoke exposure. During pregnancy, case and control mothers had similar rates of smoking, although control mothers who smoked reported smoking more cigarettes on average while pregnant (3,640) than case mothers who smoked (2,800). Smoking in the home by other household members during the pregnancy was more common for control families (40.9%) than case families (30.0%). Control mothers also reported higher rates of any alcohol consumption during pregnancy than case mothers, 31.5% versus 20.0%.

Tables 13a through 13d present the conditional logistic regression odds ratios for tobacco smoke and alcohol exposures by cancer group (leukemia and nervous system cancers; leukemia; nervous system cancers; and brain and central nervous system cancer) and age group at diagnosis (ages 0 through 19; and ages 0 through 4). Many of the tobacco smoke and alcohol exposure variables had relatively low prevalence of exposure. None of the prenatal tobacco smoke or alcohol exposure variables or the postnatal tobacco smoke exposure variables were significantly associated with case status.

Figures 5a and 5b present the graphed odds ratios for tobacco smoke and alcohol exposure variables by leukemia in all ages and brain and central nervous system cancers in all ages. The factors presented for this risk group appear to be distributed around 1.0 with no obvious pattern.

**Household-related Exposures: Chemical, Animals and Electromagnetic fields (EMFs):** Table 14 presents the prenatal and postnatal household-related exposure (chemicals, animals, and EMFs) information. The frequency of most prenatal household-related exposures were similar for case mothers and controls mothers. Car repair at home during pregnancy was higher for cases (25.0%) than controls (17.6%), while use of moth balls or moth crystals at home during pregnancy was higher for controls (21.4%) than cases (15.0%).

After the child was born, the frequency of several household-related exposures was slightly higher for controls than cases, including: yard and garden treatments (66.0% versus 50.0%); use of oil based paints, thinners, brush cleaners, and strippers (40.9% versus 25.0%); fingernail polish or remover (73.0% versus 67.5%); living with a cat (34.0% versus 20.0%); and living with a pet other than a dog or cat (37.7% versus 30.0%). Cases had somewhat higher frequencies than controls for two postnatal variables: home car repair (35.0% versus 26.4%) and regular use of a heated water bed (7.5% versus 1.3%).

Tables 15a through 15d present the conditional logistic regression odds ratios for household-related exposures by cancer group (leukemia and nervous system cancers; leukemia; nervous system cancers; and brain and central nervous system cancer) and age group at diagnosis (ages 0 through 19; and ages 0 through 4). Two odds ratios were found to be significantly associated with cancer incidence. Fingernail polish or remover use in the home during childhood was negatively associated with leukemia in all age groups (OR=0.38; 95% CI=0.14, 0.97).

Both prenatal and postnatal use of an electric blanket, electric mattress pad, or heated water bed (household appliance EMF exposure) showed variability and low precision in odds ratio estimation, due to the low exposure prevalence of these items.

A child's regular use of an electric blanket, electric mattress pad, or heated water bed was positively associated with leukemia for all ages combined (OR=12.0; 95% CI=1.25, 115) with only three case families and one control family reporting regular

use during childhood.

Figures 6a through 6d present the graphed odds ratios for household-related exposure variables by leukemia in all ages and brain and central nervous system cancers in all ages. The prenatal and postnatal household-related exposure factors appear to be randomly distributed around 1.0 with slightly more odds ratios below 1.0. The exception was a child's regular use of an electric blanket, electric mattress pad, or heated water bed which was elevated and had a very wide confidence interval, indicating a lack of precision in the estimate.

## **Interview Study Strengths and Limitations**

Phases of the Interview Study that are now complete (study design, subject recruitment, parental interviewing, and univariate analysis of interview data) can be discussed in terms of their strengths and weaknesses. A comprehensive assessment of the strengths and limitations of the Interview Study will be discussed in the Final Report when the environmental modeling and the exposure assessments for water, air, proximity to hazardous sites, and parental occupation have been completed and reported.

In considering the strengths and limitations of an epidemiologic study, it is important to consider the potential for **Abias@** (i.e., inaccuracy) in the estimated odds ratios or other outcome measures. Bias in measures of odds ratios can result from three sources: improper selection of study subjects; errors in exposure measurement or classification; and confounding (Steineck and Ahlbom, 1992). It is also important to consider the precision of odds ratio estimates, that is, the confidence that estimates are repeatable, and not subject to large random errors. Precision is strongly influenced by the size of the population under study and the prevalence of exposure.

**Selection Bias:** If the study cases or controls do not adequately represent the underlying study population, the odds ratio estimates may be biased positively or negatively (Rothman and Greenland, 1998). Cases in the Interview Study were identified through the New Jersey State Cancer Registry (SCR), a statewide population-based cancer registry with virtually complete cancer ascertainment (estimated to be greater than 99% complete) during the study period. The SCR's ascertainment of incident cancer occurs through mandated reporting by oncologists, hematologists, pathologists, other physicians, hospitals, and laboratories. It is highly unlikely that children who developed cancer were not diagnosed or treated for their disease, due to the severity of their illnesses. Therefore, it is reasonable to conclude that all incident childhood cancers occurring in the Dover Township area were registered in the New Jersey SCR, and included in the Interview Study.



Controls were randomly selected from the public school records of the Toms River School District. Since a high proportion of Dover Township children attend public schools (93%, according to 1990 U.S. Census data), school rosters provide a close approximation of the underlying residential child population. Furthermore, the high participation rate among randomly chosen control families (80%) suggests that participating controls should be representative of the underlying population. Extensive search and recruitment procedures were effective in maximizing subject location and minimizing non-participation rates.

Table 16 compares the demographic characteristics of the 39 potential controls who were not interviewed (i.e., those potential controls who were never located, refused participation, or never responded) with the 159 interviewed controls. The participant and nonparticipant characteristics were generally similar. Nonparticipants were found to have an earlier mean year of birth (1976 versus 1980), resided less frequently in Dover Township at the time of the child's birth (23% versus 53%), and less likely to be the mother's first born child (21% versus 41%) than participants. The nonparticipants and participants were similar for mean weight at birth (3,361 versus 3,352 grams), race (2.6% versus 3.1% nonwhite), and maternal age at the time of birth of the study child (26 versus 27 years).

Because of concerns that the matched controls selected for the 17 cases diagnosed prior to age 6 had to be Dover Township residents at both the time of the case's diagnosis and the time of entry into school, the school status of cases during the school year when their matched controls were selected from school rosters was evaluated. School enrollment of the 17 cases diagnosed prior to school age is shown in Table 17. Eleven (64.7%) of the 17 cases were found on the Toms River School District rosters for the same year as their matched controls. Three case children diagnosed prior to school age were not found on the School District rosters from which their controls were selected, and three additional case children diagnosed prior to school age died prior to reaching first grade. These data show that cases and

controls were similar in their residency duration in Dover Township from the date of case's diagnosis to entry into school.

Among the case children diagnosed after reaching school age (6 or more years), all 21 were found on the Toms River School District rosters in the same year from which their matched controls were selected. These data indicate that the public school records were a good source to identify control children for this community.

**Exposure Misclassification Bias:** Odds ratio estimates may be biased by inaccurate classification of study subject exposures (Rothman and Greenland, 1998). When exposure classification errors are made similarly among cases and controls, the odds ratio estimate is more likely to show no increase in disease risk for that exposure. However, if exposure classification errors are more likely to be made in either cases or controls (differential misclassification), the odds ratio estimate may be biased either higher or lower (Copeland et al., 1977).

Questionnaire-based information dependent on recall of past behaviors or experiences may be particularly susceptible to differential misclassification if cases are more or less likely to report specific exposures or activities. A potential weakness of the Interview Study is that parents of cases may have differentially recalled their child's actual exposure histories, when compared with parents of control children. In order to minimize this bias, identical procedures for notification and interviewing all participants were employed; experienced interviewers were used; and copies of the questionnaire were not made available publicly until after the completion of all parental interviews.

With the exception of cancer diagnoses obtained from the State Cancer Registry, all medical information in the Interview Study was self-reported, and was not validated against medical records. Accuracy is dependent upon parental recall and knowledge of the requested medical information.

In order to assess the validity of Interview Study responses, data available from both parental interviews and birth certificates were compared for all cases born in

New Jersey (n=32) and a random selection of controls born in New Jersey (n=53). Concordance for gender, race and categorical maternal age at birth were 100%. Very high concordance in both cases and controls (97% to 100%) was also seen for being first live birth of mother and categorical birth weight. Concordance of maternal address at time of child's birth was 91% in cases and 96% among controls. Categorical number of prior pregnancies was less concordant (86% among cases and 85% among controls).

**Confounding:** Confounding bias occurs when the "background" risk of disease differs between the exposed and unexposed in the study population as a result of different distributions of risk factors other than the exposure of interest (Miettinen, 1974). A confounder or confounding variable is defined to be A...a factor that distorts the apparent magnitude of the effect of a study factor on risk. Such a factor is determinant of the outcome of interest and is unequally distributed among the exposed and the unexposed@ (Last, 1983). In this Interim Report, unadjusted odds ratios are presented for each factor without adjusting for potential confounding. Potential bias due to confounding by gender and/or year of birth was minimized by the Interview Study's matched design. In the Final Report, potential confounding among the risk factors will be considered and statistical adjustments made as needed.

**Precision:** With a total of 40 cases and 159 controls, and with considerably fewer subjects in each cancer type and age grouping, odds ratio estimates from the Interview Study are inherently imprecise. Using multiple controls per case in this study serves to increase precision. However, inherent problems remain when a relatively small study population is evaluated, limiting the study's ability to identify modestly elevated odds ratios as statistically significant for the cancers of interest.

For example, when minimum detectable odds ratios (MDORs) were calculated using the method of Schlesselman (1982), the Interview Study was determined to be able to detect associations of 2.8 and larger for a prevalence of exposure equal to

20% (assuming  $\alpha=0.05$ ,  $\beta=0.20$ ). Given these assumptions, if the true odds ratio is 2.8 or larger, one would detect a statistically significant effect 80% of the time. If the odds ratio is lower than 2.8, the probability of detecting a statistically significant effect would be less than 80%. Using the same assumptions as above, other MDORs in the Interview Study ranged from 3.7 to 5.5 for smaller age and cancer groupings, such as leukemia in children under age five.

**Multiple Comparisons:** When researchers independently examine statistical associations for a large number of risk factors, it is likely that some number of false positive results will be found, due to the large numbers of comparisons conducted. While it is possible to statistically correct for this concern, it is controversial whether such corrections are needed (Savitz and Olshan, 1995; Thompson, 1998). We have chosen to present individual confidence intervals without adjustment for multiple comparisons.

In summary, the strengths of the Interview Study include the Study's excellent response rates and cooperation of study families, while the limitations include the Study's low statistical power and potential recall bias.

## **BIRTH RECORDS STUDY**

### **Birth Records Study Methods**

**Geographic Area of Study:** The geographic area for the Birth Records Study is Dover Township, New Jersey. Cases and controls were required to have mothers who resided within Dover Township at the time of the study child's birth.

**Case Definition:** A case is defined as a child who: 1) was diagnosed with any form of cancer; 2) was under age 20 at the time of his or her diagnosis; 3) was diagnosed between January 1, 1979 and December 31, 1996; and 4) the child's mother must have been a resident of Dover Township at the time of the child's birth, based on birth certificate address information.

**Case Identification:** Childhood cancer cases (diagnosed 1979 - 1996 inclusive) from the New Jersey State Cancer Registry were matched against the birth records of the New Jersey Vital Statistics and Registration Office in order to determine those cases of childhood cancer whose mothers were Dover Township residents at the time of the child's birth. To identify Dover Township births that may have been diagnosed with cancer after moving out of state, information on pediatric cancers was sought from ten out-of-state cancer registries including Florida, Pennsylvania, New York, Virginia, California, North Carolina, Georgia, Massachusetts, Delaware, and Texas. A list of all births in Dover Township from 1966 through 1996 compiled by the New Jersey Center for Health Statistics (CHS) was matched with records from these out-of-state cancer registries. The first year of available electronic birth data from the CHS is 1966.

**Control Definition:** Ten controls were selected for each case child and matched to the case as described below. The definition of a control child includes: 1) the mother was a resident of Dover Township at the time of the child's birth; 2) the control was the same gender as the matched case; and 3) the control child was born

in the same year as the matched case.

**Control Selection:** For each case, controls were randomly selected from all eligible births using the above matching criteria, from the birth records of the New Jersey Center for Health Statistics.

**Data Collection:** Information for this study consisted of data available on the study child's birth certificate.

**Factors Analyzed/Discussed in Current Report:** The following information collected from birth certificates will be discussed in this Interim Report.

- < **Demographic, pregnancy and birth characteristics.** Mother's and father's age and education; mother's previous pregnancy history including losses and terminations; child's birth weight, gestational age and birth order; adequacy of prenatal care; Apgar score; complications of pregnancy, labor and delivery; delivery method; congenital malformations or other abnormal conditions of the newborn.
- < **Exposure to tobacco smoke and alcohol.** Mother's smoking and alcohol consumption during pregnancy.

**Analytic Methods:** Data analyses were conducted in the manner described previously for the Interview Study. The case groupings for the Birth Records Study include: all cancers combined (all cases); leukemia alone; all nervous system cancers; brain and central nervous system cancer separately; and all other cancers. As in the Interview Study, the Birth Records Study children were divided into two age groups within each cancer grouping: children diagnosed prior to age 20 (all cases) and children diagnosed prior to age five. Adequacy of prenatal care utilization was evaluated using the Kotelchuck method (1994). The Kotelchuck method attempts to characterize the adequacy of prenatal care utilization on two independent and distinctive dimensions: prenatal care initiation and the number of prenatal visits.

## **Birth Records Study Results**

Matching of the New Jersey State Cancer Registry (SCR) records from 1979 through 1996 against the New Jersey Vital Statistics and Registration Office's birth records identified a total of 48 children with cancer born to mothers living in Dover Township at the time of the child's birth. Table 18 presents a summary of where these children resided at the time of their diagnoses. Of the 48 cases, 41 were residents of Dover Township when diagnosed with cancer, five of the cases resided in another Ocean County community, and one resided in another New Jersey county at the time of their diagnoses. Of the 41 cases who were residents of Dover Township both at birth and at diagnosis, 24 were diagnosed with leukemia or nervous system cancer, and thus were also included in the Interview Study.

Electronic birth record data matching with out-of-state cancer registries was completed for nine of ten registries approached (Florida, Pennsylvania, New York, Virginia, California, North Carolina, Massachusetts, Delaware, and Texas) and did not find any additional cases. One registry (Georgia) denied access on the basis of confidentiality concerns. Information on one case diagnosed while living in another state was provided by the SCR.

Table 19 presents the age of diagnosis and cancer type of the 48 eligible cases. Leukemia accounted for 16 of the cases (33.3%), while sympathetic nervous system cancer accounted for six cases (12.5%), and brain and central nervous system cancer accounted for seven cases (14.6%). The other cancers include: five lymphoma cases (10.4%); four soft tissue sarcoma cases (8.3%); two renal cancer cases (4.2%); two melanoma cases (4.2%); and one case each of thyroid cancer, nasopharyngeal cancer, gonadal germ-cell tumor, other specified malignant tumor, other unspecified malignant tumor, and cancer in-situ of the cervix.

Controls were randomly selected from New Jersey birth records for Dover Township. Ten controls were selected for each case and matched on the case's year of birth and gender. Birth certificates for all children were photocopied and

residential addresses inspected to ensure complete information. Three selected controls with missing address information (two listed P.O. boxes and one was blank) were replaced with other randomly selected controls. Over 99% of the originally selected controls were used in the study (477/480).

**Demographic, Pregnancy and Birth Characteristics:** Table 20 presents demographic, pregnancy and birth characteristics of the study population. There were nearly an equal number of male and female cases (23 and 25 respectively). When parent's race was known, virtually all case and control parents were white (97.6%). The period 1980-84 had the highest number of case births, 14 (29.2%), while the period 1985-90 had the highest number of case diagnoses, 22 (45.8%). The birth mother's average age at the time of the child's birth was similar for both cases (27.2 years) and controls (27.1 years), as was the case birth father's average age (30.1 years) and the control birth father's average age (30.0 years). Maternal education was similar for both case and control groups with 18.8% of the case mothers and 17.5% of the control mothers having 16 or more years of education. Paternal education differed by case and control group with 18.8% of the case fathers and 26.5% of the control fathers having 16 or more years of education.

Mother's pregnancy histories differed by case and control group for one or more prior pregnancies of the mother (83.4% and 67.3%). Maternal pregnancy histories did not differ by case and control group for the number of previous terminations and stillbirths. Complications of the mother's pregnancy with the child was slightly higher for case mothers than control mothers (22.9% and 17.5%) while any complications of labor or delivery were slightly lower for case mothers than control mothers (20.8% and 26.3%). Any abnormal conditions of the child, any congenital malformations of the child, adequacy of prenatal care utilization, delivery method, and mother's weight gain were similar for case and control groups.

The percentage of children who were first live births of their mother differed by case (18.8%) and control (39.0%) group. The average birth weight for cases (3,602



grams) was higher than for controls (3,407 grams). Both case and control groups had an average pregnancy duration of 40 weeks.

Tables 21a through 21e present the conditional logistic regression odds ratios for the demographic, pregnancy, and birth characteristic variables by cancer group (all cancers combined; leukemia; nervous system cancers; brain and central nervous system cancers; and all other cancers combined) and age group (ages 0 through 19; and ages 0 through 4). Almost all odds ratios for being the first live birth of the mother were below 1.0. Being the first live birth was negatively associated with all cancers in all ages combined (OR=0.35; 95% CI=0.16, 0.75) and the all other cancer group in all ages combined (OR=0.18; 95% CI=0.04, 0.83).

The odds ratios for having less than adequate prenatal care utilization were generally mixed, but positively associated with leukemia in all ages combined (OR=3.81; 95% CI=1.16, 12.5) and leukemia in children diagnosed prior to age five (OR=16.3; 95% CI=1.75, 152) and negatively associated with nervous system cancers in all ages combined (OR=0.12; 95% CI=0.01, 0.95).

Odds ratios for birth weights of 4000 grams or higher were nearly all above 1.0. High birth weight was positively associated with leukemia in children diagnosed prior to age five (OR=5.66; 95% CI=1.07, 29.9).

Mother's and father's educational level displayed mixed odds ratios. Low maternal education (less than 12 years) was positively associated with leukemia in children diagnosed prior to age five (OR=8.33; 95% CI=1.23, 56.6).

The odds ratio for any complications of pregnancy with the child was elevated for brain and central nervous system cancers in children diagnosed prior to age five (OR=6.71; 95% CI=0.91, 49.5) and positively associated with nervous system cancer in children diagnosed prior to age five (OR=4.94; 95% CI=1.26, 19.4). The types of pregnancy complications on the birth certificate varied substantially and provided no clear insight into the meaning of these results.

Figures 7a and 7b present the graphed odds ratios for demographic,

pregnancy, and birth characteristics by leukemia in all ages and brain and central nervous system cancers in all ages.

**Exposure to Tobacco Smoke and Alcohol:** Table 22 presents the tobacco smoke and alcohol exposures of the study population. Since this information was not collected on birth certificates until 1989, nearly 90% of the study subjects had no data. Because of the sparsity of data for these variables, no odds ratios were calculated.

### **Birth Records Study Strengths and Limitations**

Phases of the Birth Records Study that are now complete (study design, data collection, and univariate analysis of birth certificate data) can be discussed in terms of their strengths and weaknesses. A complete assessment of the strengths and limitations of the Birth Records Study will be discussed in the Final Report when the environmental modeling and the exposure assessments for water, air, and proximity to hazardous sites have been completed and reported.

In considering the strengths and limitations of an epidemiologic study, it is important to consider the potential for **Abias®** (i.e., inaccuracy) in the estimated odds ratios or other outcome measures. Bias in measures of odds ratios can result from three sources: improper selection of study subjects; errors in exposure measurement or classification; and confounding (Steineck and Ahlbom, 1992). It is also important to consider the precision of odds ratio estimates, that is, the confidence that estimates are repeatable, and not subject to large random errors. Precision is strongly influenced by the size of the population under study and the prevalence of exposure.

**Selection Bias:** If the study cases or controls do not adequately represent the underlying population, the odds ratio estimates can be biased positively or negatively (Rothman and Greenland, 1998). Case ascertainment for the Birth Records Study used the New Jersey State Cancer Registry, a population-based cancer registry with virtually complete cancer ascertainment (estimated to be greater than 99% complete)

during the study period. In addition, attempts were made to find children who were born in Dover Township and then migrated to other states before diagnosis, by reaching out to cancer registries of ten other states. The nine states that provided data were the destination of 70% of Ocean County out-migrants between 1985 and 1990, according to U.S. Census data. It is possible that eligible individuals, whose mothers were Dover Township residents at the time of their birth, may have developed cancer prior to their 20<sup>th</sup> birthday while residing outside of the U.S., or in one of the states where matching was not performed. However, we have no reason to believe that the case series for this study is not representative of all possible cases.

The controls in the Birth Records Study were randomly selected from a population-based sampling frame (birth certificate records for the State of New Jersey) which includes the entire population of births among Dover Township residents. Since only three of the 483 randomly selected birth certificates (less than one percent) had to be excluded because of inadequate address information, the Birth Records Study's controls can be considered to be a representative sample of the underlying population.

**Exposure Misclassification Bias:** Odds ratio estimates may be biased by inaccurate classification of study subjects on exposure status (Rothman and Greenland, 1998). When exposure classification errors are made similarly among cases and controls, the odds ratio estimate is more likely to show no increase in disease risk for that exposure. However, if exposure classification errors are more likely to be made in either cases or controls (differential misclassification), the odds ratio estimate may be biased either higher or lower. In the Birth Records Study, all information was collected at the time of birth directly from the parents or from maternal or child medical charts. Thus, these data could not be susceptible to any potential errors caused by differential recall between cases and controls.

**Confounding:** Confounding bias occurs when the "background" risk of disease differs between the exposed and unexposed in the study population as a result of

different distributions of risk factors other than the exposure of interest (Miettinen, 1974). In this Interim Report, unadjusted odds ratios are presented, without adjustment for potential confounders. In the Birth Records Study, potential bias due to confounding by gender and year of birth was minimized in the design through matching. In the Final Report, potential confounding among the factors will be considered and statistical adjustments made as needed.

**Precision:** With 48 cases and 480 controls overall, and with fewer subjects in each cancer subset and age grouping, odds ratio estimates from the Birth Records Study are inherently imprecise. Using multiple controls per case in this study serves to increase precision. However, inherent problems remain when a relatively small study population is evaluated, limiting the study's ability to identify moderately elevated odds ratios as statistically significant for the cancers of interest and any potential risk factor.

For example, when minimum detectable odds ratios (MDORs) were calculated using the method of Schlesselman (1982), the Birth Records Study was found to be able to detect associations of 2.4 and larger for a prevalence of exposure equal to 20% (assuming  $\alpha=0.05$ ,  $\beta=0.20$ ). Given these assumptions, if the true odds ratio is 2.4 or larger, you would detect a statistically significant effect 80% of the time. If the odds ratio is lower than 2.4, the probability of detecting a statistically significant effect would be less than 80%. Using the same assumptions as above, other MDORs in the Birth Records Study ranged from 3.6 to 7.5 for smaller age and cancer groupings, such as leukemia in children under age five.

**Multiple Comparisons:** When researchers independently examine statistical associations for a large number of risk factors, it is likely that some number of false positive results will be found, due to the large numbers of comparisons conducted. While it is possible to statistically correct for this concern, it is controversial whether such corrections are needed (Savitz and Olshan, 1995; Thompson, 1998). We have chosen to present individual confidence intervals without adjustment for multiple

comparisons.

In summary, the strength of the Birth Records Study is that the data used is free of exposure misclassification due to recall error, since all data were prospectively recorded on the birth certificate around the time of birth. Limitations of the Birth Records Study are that no information on the child's postnatal exposures was available and the study's low statistical power.

## DISCUSSION

The results in this Interim Report should be interpreted cautiously and in conjunction with existing biological and epidemiologic knowledge. Due to the relatively small number of subjects in each study, the statistical analyses are very sensitive to the numbers in each comparison. Slight fluctuations in the numbers can result in substantial variation in the odds ratios. As a consequence, many sizable and imprecise associations were found, as might be expected in a study of limited size. Interpretation of the data needs to be done cautiously because the evaluation of parental occupation and the complex environmental assessments (air sources, water sources, and proximity to hazardous sites) are still in progress. Complete analyses and interpretations will be available in the Final Report.

The purpose of the following section on Risk Factor Evaluation is to discuss the findings in terms of the magnitude of the exposure odds ratios, the consistency between the Interview and Birth Records Studies, and consistency with previous studies conducted in other populations.

### **Risk Factor Evaluation**

***Demographic, Pregnancy and Birth Characteristics:*** Demographic, pregnancy, and birth characteristics were evaluated for their associations with childhood cancer in both the Interview Study and the Birth Records Study. Characteristics examined in both studies include: birth weight, being the mother's first live birth, parental education, age of the mother at the time of the child's birth, and birth order of the child.

In the Birth Records Study, birth weight of 4,000 grams or more had a positive association with leukemia in children diagnosed prior to age five. Furthermore, the odds ratios for high birth weight were elevated compared to controls for all cancers

groups and age groups evaluated.

In the Interview Study, odds ratios for high birth weight were elevated but not statistically significant for all cancer groups and age groups evaluated (except brain and central nervous system cancer in children diagnosed before age five), and were particularly evident for children with leukemia diagnosed prior to age five.

The statistically significantly elevated odds ratios for high birth weight in the Birth Records Study and the elevated odds ratios in the Interview Study suggest an association between high birth weight and leukemia, especially in children diagnosed under age five. However, the published literature on birth weight and childhood cancer is contradictory with regard to such an association (Chow et al., 1996).

In the Birth Records Study, being the mother's first live birth was found to have a negative association for all cancers combined and all other cancers combined. The odds ratios were decreased, but not statistically significant for being the mother's first live birth, in all age groups except brain and central nervous system cancers in children diagnosed prior to age five. In the Interview Study, being the mother's first live birth did not show any clear association, though many of the odds ratios were decreased but not statistically significant. The negative association between cancer incidence and being the mother's first live birth has been reported in the published literature (Chow et al., 1996).

Mother's age greater than 34 years at the time of the child's birth has been found to be a risk factor for childhood cancer in some previously published studies (Hemminki et al., 1999). Although not statistically significant, many of the odds ratios for maternal age greater than 34 years were elevated in the Birth Records Study. In the Interview Study, no clear direction of association was observed between maternal age above 34 and cancer incidence. It is important to note that both studies had a relatively small number of mothers over age 34.

In the Birth Records Study, the results differ among cancer types for prenatal care utilization being a risk factor. While having less than adequate prenatal care

utilization was positively associated with leukemia (especially in children diagnosed prior to age five), it was negatively associated with nervous system cancers. Inadequate prenatal care utilization could be a socioeconomic status surrogate for poor access to health care in general.

In the Interview Study, parental education displayed different patterns by cancer type: elevated odds ratios were generally found for a lower educational level of the mother or father and leukemia; while elevated odds ratios were found for a higher educational level of the mother or father and nervous system cancers. As in the Interview Study, the Birth Records Study also found elevated odds ratios for a lower educational level of the mother or father and leukemia. These findings contrast with some prior studies that have reported that children with higher socioeconomic status are at increased risk for leukemia (Chow et al., 1996).

In the Birth Records Study, any complications of pregnancy was positively associated with nervous system cancers in children diagnosed prior to age five. However, the types of complications on the birth certificate varied and provided no clear insight into the meaning of these results.

**Family Medical History:** Previous studies have demonstrated that certain genetic syndromes or heritable factors may be an important risk factor for some types of childhood cancer (Pritchard-Jones et al., 1996). In addition, some studies have found increased occurrence of cancer in relatives of children with leukemia or brain cancer (Chow et al., 1996). In the Interview Study, neither family history of cancer nor a history of birth defects or inherited conditions showed any clear association with childhood cancer. Although not statistically associated, a history of any type of cancer in the parents of a child was elevated for nervous system cancers. This appears to be due to the influence of the sympathetic nervous system cases since the odds ratio for a history of any type of cancer in the parents of a child was not elevated for brain and central nervous system cancers.

**Health, Medical Conditions and Medical Procedures:** In the Interview



Study, use of antibiotics for ten days or more by the child was positively associated with leukemia and nervous system cancers combined for both age groups. In addition, the odds ratios for this variable were elevated but not statistically significant for all cancer groups and age groups evaluated. This association may be due to the necessity of the child taking antibiotics to treat diseases that are directly or indirectly related to the cancer. One previous study has reported an association between two specific antibiotics, chloramphenicol and syntomycin, and childhood leukemia (Shu et al., 1988).

A child's exposure to diagnostic x-rays was positively associated in children diagnosed prior to age five with leukemia and nervous system cancers combined, and with nervous system cancers alone. Diagnostic x-rays generally had elevated odds ratios, but were not statistically significant, for all cancer groups and age groups evaluated, as well as for both prenatal (mother during pregnancy) and postnatal (child) exposures. The literature indicates that x-ray exposure during pregnancy or radiation therapy during childhood can cause childhood cancer (Zahm and Devesa, 1995; Greenberg and Schuster, 1985). However, exposure to diagnostic x-rays also could be directly associated with the treatment of the cancer or may be reflective of the use of x-rays to diagnose the cancer itself. When this variable was reevaluated with x-rays occurring within one year of a child's diagnosis removed from the analysis, the resulting odds ratios were substantially lower and not statistically significant.

**Dietary Factors:** Diet can play a vital role in the health of an individual. The use of multivitamins and the high consumption of fruits and vegetables during pregnancy have been reported to reduce the risk of childhood brain tumors (Preston-Martin et al., 1998; Bunin et al. 1993). Consumption of cured or processed meats compounds have been reported to increase the risk of childhood brain cancer or leukemia in some studies but not others (Bunin et, 1993; Peters et al., 1994; Sarasua and Savitz, 1994).

Consumption of fresh fruits and vegetables displayed no statistical association

with cancer incidence. Mothers' use of multivitamin supplements during pregnancy was found to be negatively associated with leukemia and nervous system cancers combined and leukemia alone. Furthermore, all odds ratios were decreased below 1.0 for prenatal maternal multivitamin supplementation. Published studies of childhood brain cancer have reported a potential protective effect for multivitamin usage.

Many of the dietary cured meat variables (hot dogs; bacon, ham, or sausage; lunch meat; and cured meat) were negatively associated with cancer incidence. This is contradictory with the published literature identifying these foods as potential risk factors for childhood cancer. The inconsistency may be a result of confounding by other variables, differential recall between case and control families in answering these questions or chance variation given the small sample size.

Prenatal consumption of greater than four glasses of tap water or drinks made from tap water per day was positively associated with leukemia. However, odds ratios for water consumption were generally mixed by cancer type and age group, with some elevated and some decreased. It should be noted that the source of the tap water was not taken into account in this evaluation and, therefore, this finding should be interpreted cautiously. Drinking water source assessments (Dover Township public water by wellfield; private wells in Dover Township; or water from outside of Dover Township) will be addressed in detail in the Final Report.

**Exposure to Tobacco Smoke and Alcohol:** Some studies suggest that parental smoking increases the risk of leukemia in children, but the evidence is mixed and inconclusive (Klebanoff et al., 1996; Zahm and Devesa, 1995). In this study, exposure to tobacco smoke, either prenatally or postnatally, was not associated with cancer incidence. Maternal alcohol consumption during pregnancy was also not associated with cancer incidence. In the Birth Records Study, maternal smoking and alcohol consumption during pregnancy were not evaluated since these data were not collected until late in the study period (1989 onward).

**Household-Related Exposures: Chemicals, Animals and Electro-Magnetic Fields (EMFs):** Both prenatal and postnatal regular use of an electric blanket, electric mattress pad, or heated water bed (household appliance EMF exposure) showed wide variability in the odds ratios. Although a child's regular use of these appliances was positively associated with leukemia, usage of these items was not very prevalent in the study population. Some scientists suggest that exposure to household appliance EMF can cause childhood leukemia or brain cancer while others argue that the data are still inconclusive (Hatch et al., 1998; Savitz et al., 1990; London et al., 1991; Preston-Martin et al., 1996a; Gurney et al., 1996).

Fingernail polish or remover used in the home during childhood was negatively associated with leukemia incidence. However, there was no consistent direction in odds ratios seen for fingernail polish usage or exposure to household pets, farm animals, geese or ducks, or other household chemical variables.

### **Interim Report Summary**

This is an exploratory study and the results of this Interim Report should be interpreted cautiously and in conjunction with existing biological and epidemiologic knowledge. Due to the relatively small number of subjects in each study, the statistical analyses are very sensitive to slight fluctuations in the numbers, which can result in substantial variation in the odds ratios. As a consequence, many sizable, imprecise associations were found as might be expected in a study of limited size. This study has attempted to increase precision of the odds ratios by examining cases from all available years of a population-based state cancer registry, and by having large numbers of controls relative to cases (four controls per case in the Interview Study, and ten controls per case in the Birth Records Study).

The complete analysis of the Interview Study and Birth Records Study will be available in the Final Report, which is expected to be released in the latter part of the year 2000. Multivariate analyses will be performed to determine which variables

show stable associations with disease risk when potential confounding is controlled. The Final Report will include the complete analysis of the risk factors presented in the Interim Report, as well as the analysis of all parental occupational data, the proximity to hazardous sites evaluation, and the environmental risk factors based on the historic modeling of water and air pollution sources which are currently being developed at ATSDR and the Environmental and Occupational Health Sciences Institute, respectively.

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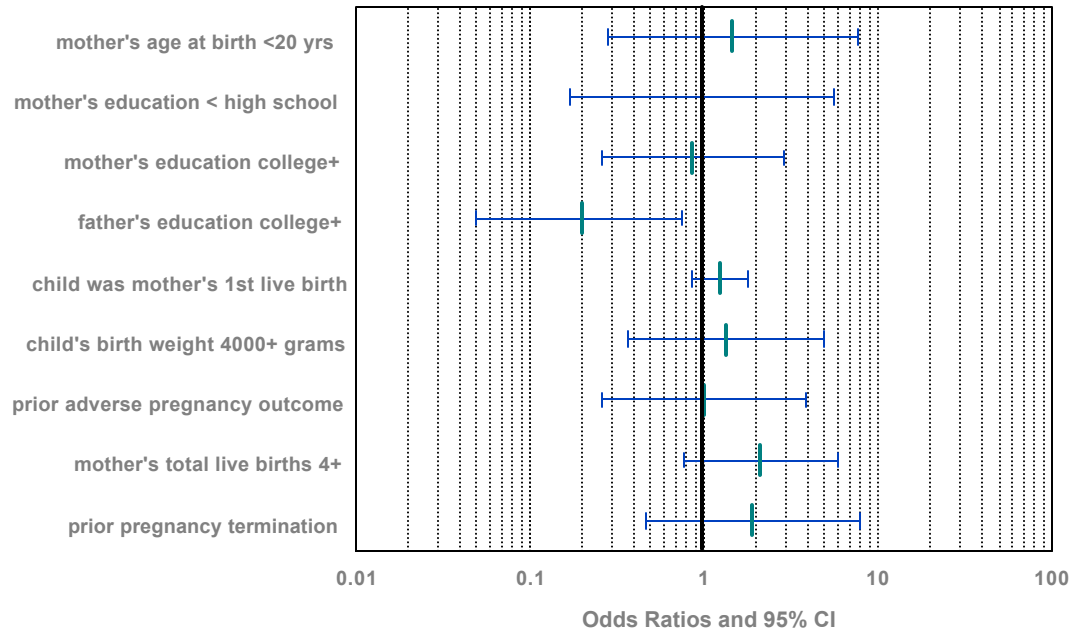
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## **FIGURES**



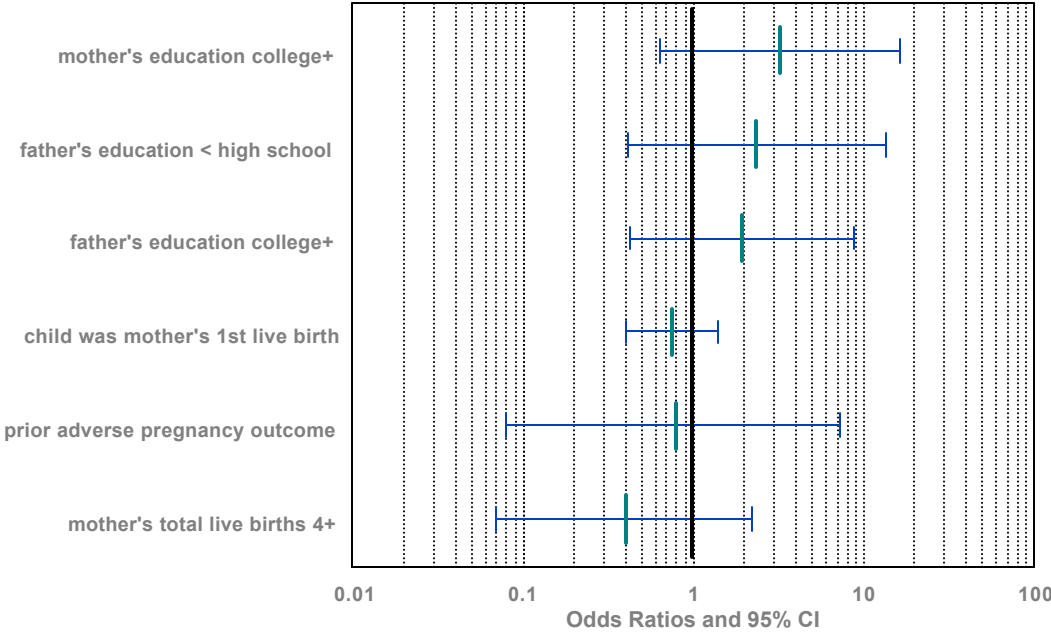
**Figure 1a: Interview Study Demographic, Pregnancy, and Birth Characteristics**

**Leukemia: Diagnosis Ages 0 - 19**



Data from Table 5b

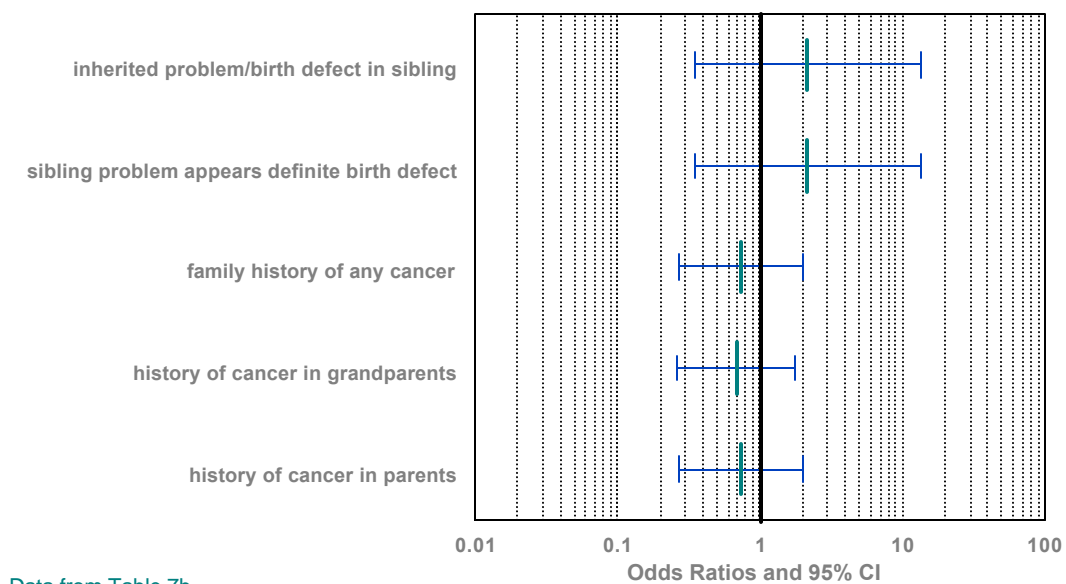
**Figure 1b: Interview Study Demographic, Pregnancy, and Birth Characteristics**  
**Brain and Central Nervous System Cancers: Diagnosis Ages 0 - 19**



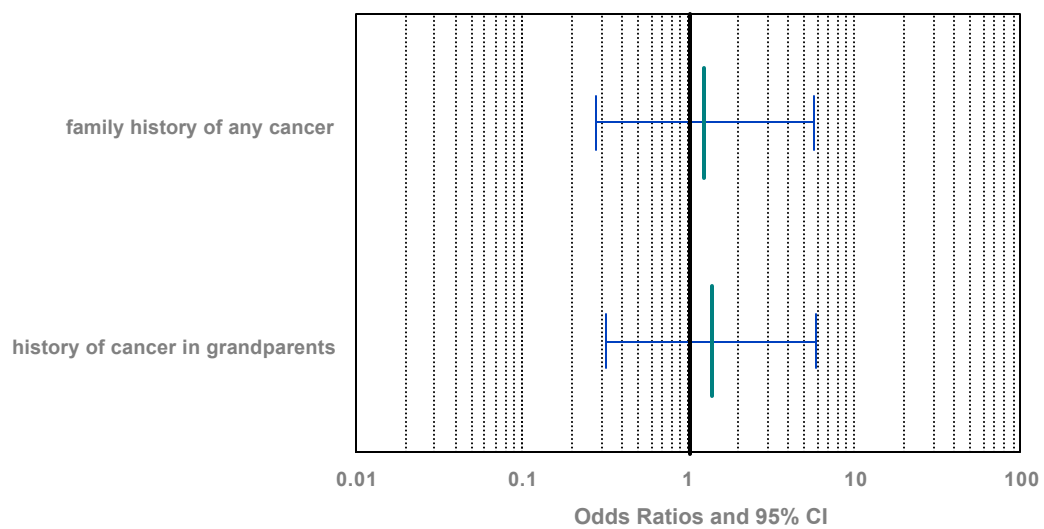
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**Figure 2a: Interview Study Family Medical History**

Leukemia: Diagnosis Ages 0 - 19



**Figure 2b: Interview Study Family Medical History**  
**Brain and Central Nervous System Cancers: Diagnosis Ages 0 - 19**



Data from Table 7d

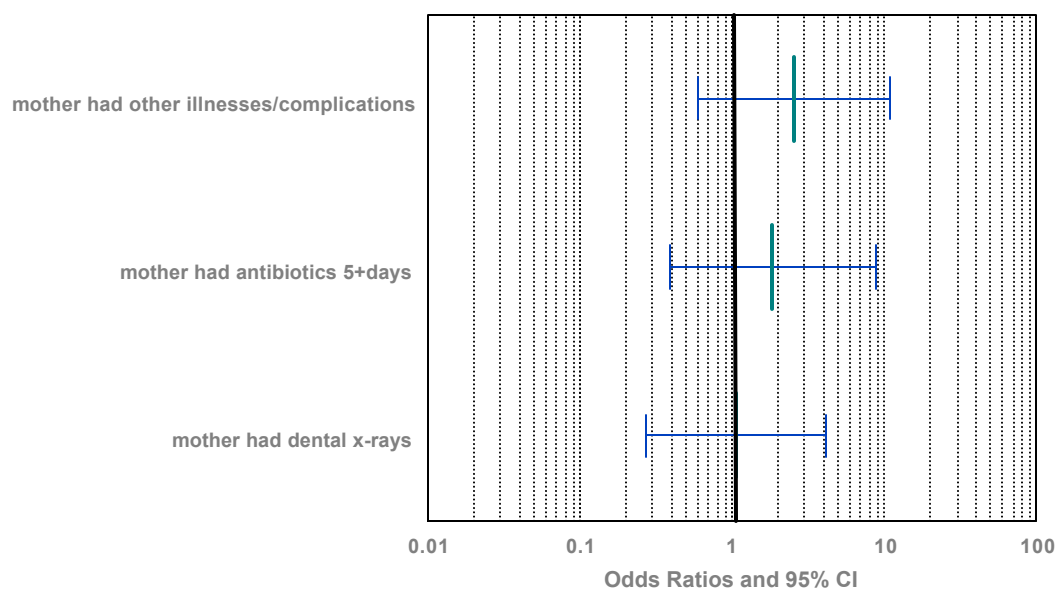


**Figure 3a: Interview Study Prenatal Health, Medical Conditions and Medical Procedures**  
**Leukemia: Diagnosis Ages 0 - 19**



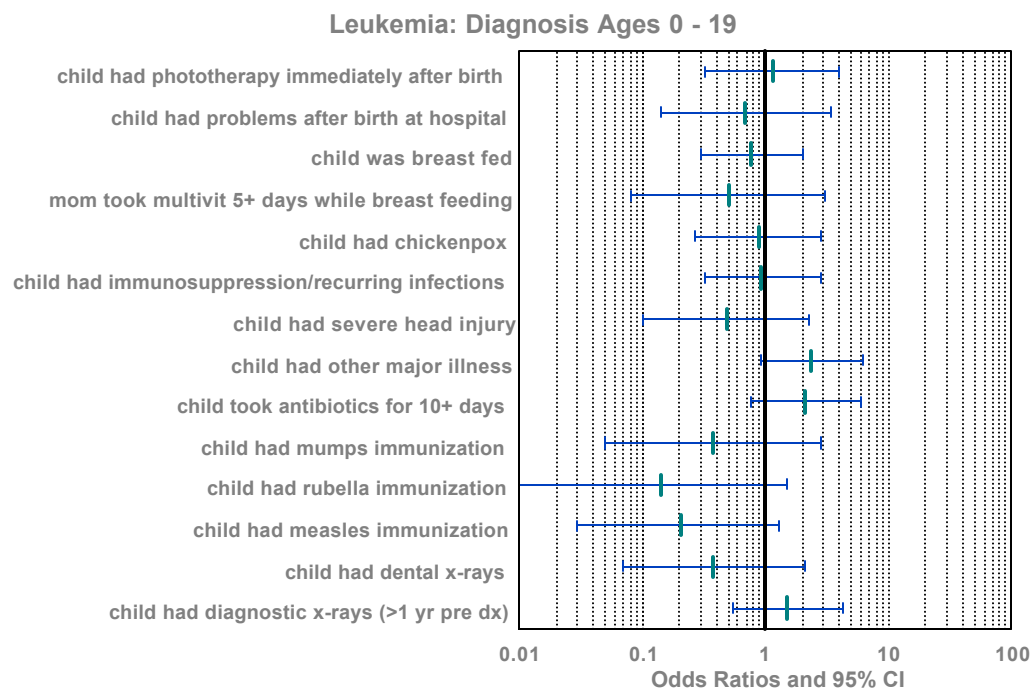
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**Figure 3b: Interview Study Prenatal Health, Medical Conditions and Medical Procedures**  
**Brain and Nervous System Cancers: Diagnosis Ages 0 - 19**



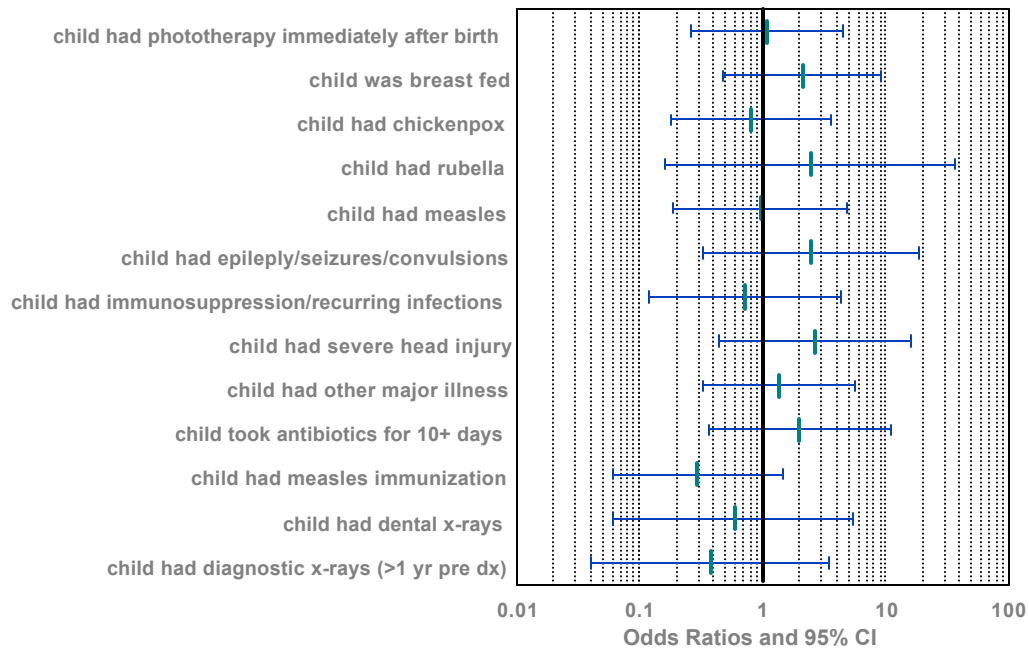
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**Figure 3c: Interview Study Postnatal Health, Medical Conditions and Medical Procedures**



Data from Table 9b

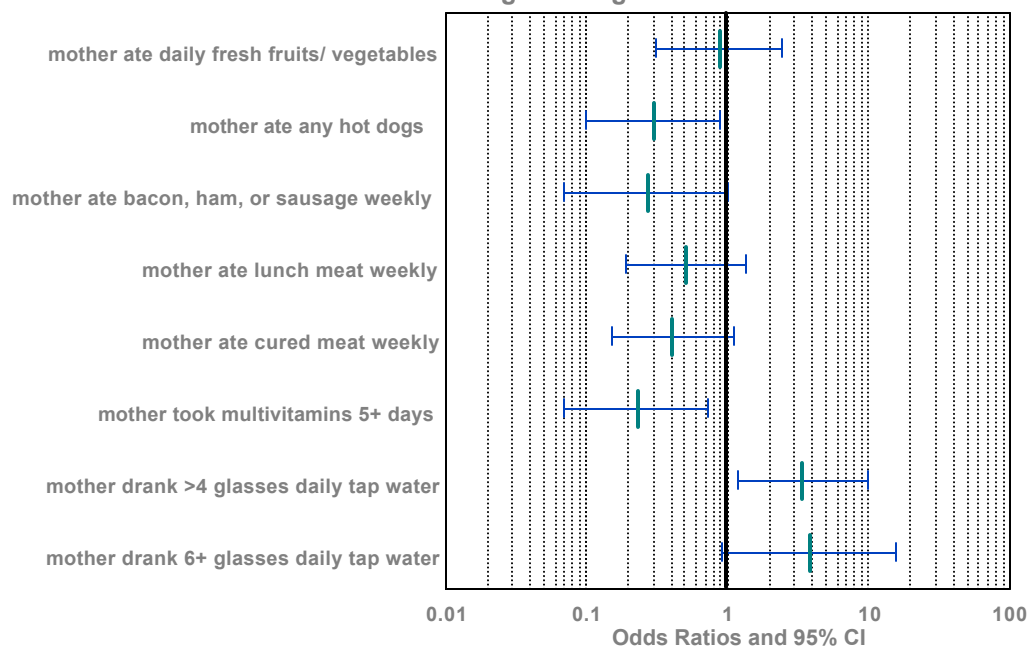
**Figure 3d: Interview Study Postnatal Health, Medical Conditions and Medical Procedures**  
**Brain and Central Nervous System Cancers: Diagnosis Ages 0 - 19**



Data from Table 9d

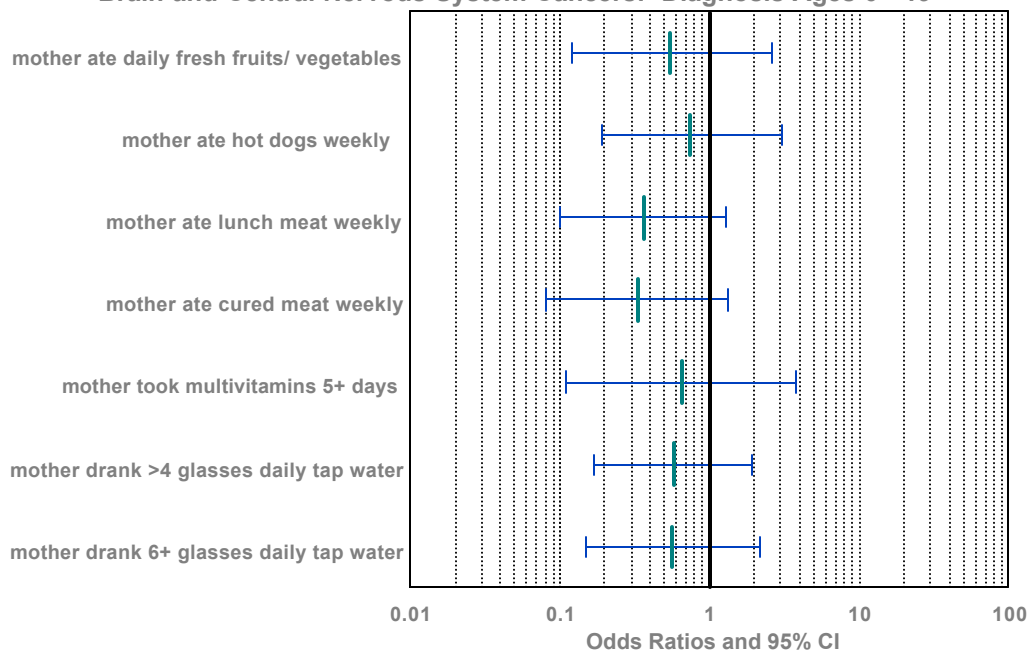
**Figure 4a: Interview Study Prenatal Dietary Factors**

Leukemia : Diagnosis Ages 0 - 19



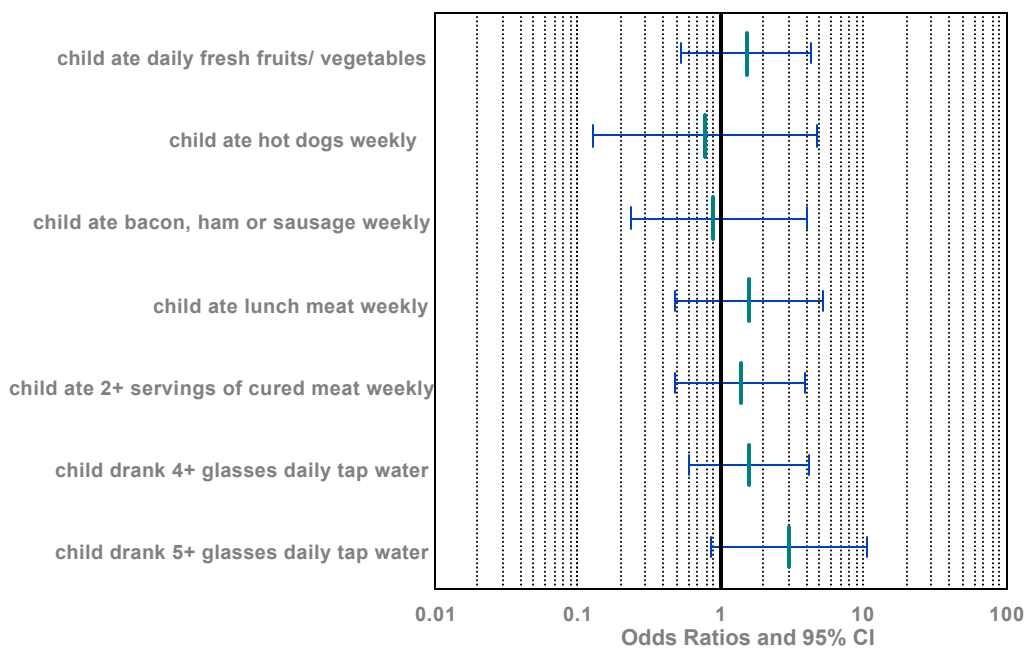
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**Figure 4b: Interview Study Prenatal Dietary Factors**  
**Brain and Central Nervous System Cancers: Diagnosis Ages 0 - 19**



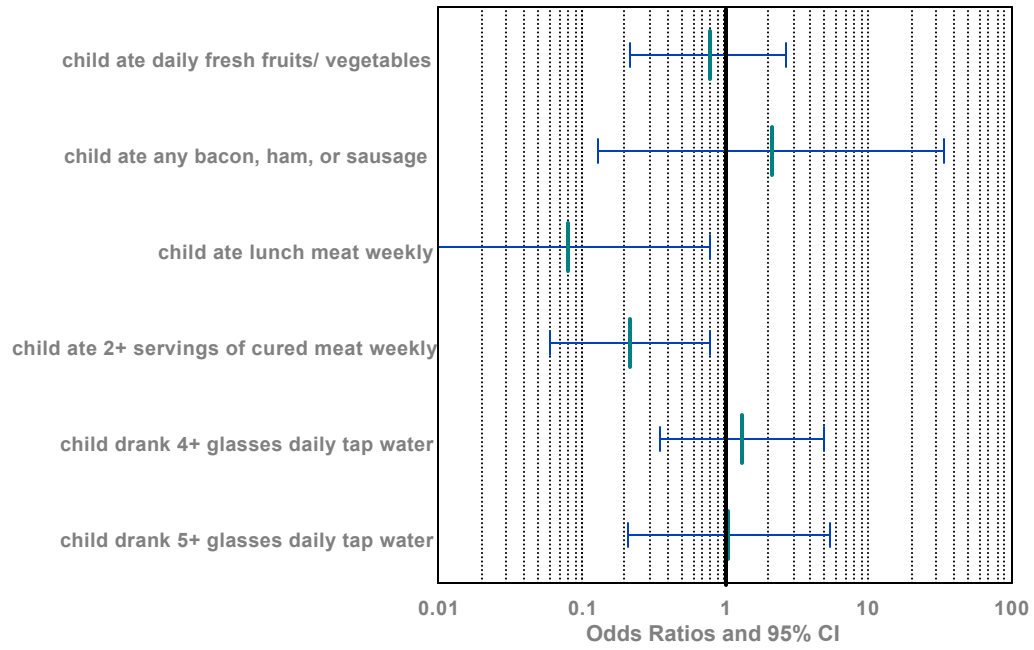
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**Figure 4c: Interview Study Postnatal Dietary Factors**  
**Leukemia : Diagnosis Ages 0 - 19**



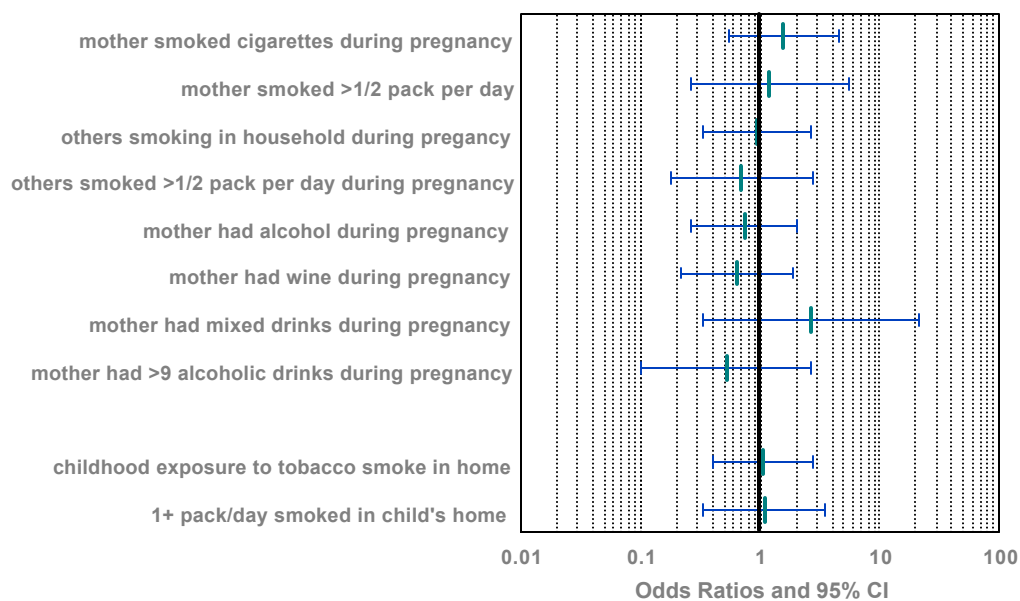
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**Figure 4d: Interview Study Postnatal Dietary Factors**  
**Brain and Central Nervous System Cancers: Diagnosis Ages 0 - 19**



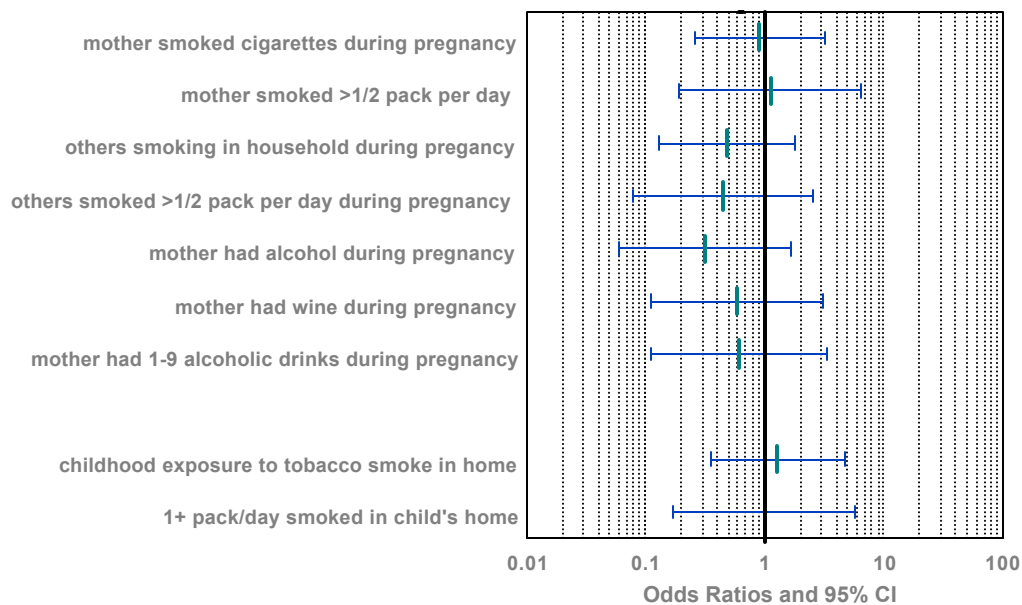


**Figure 5a: Interview Study Exposure to Tobacco Smoke and Alcohol**  
**Leukemia: Diagnosis Ages 0 - 19**



Data from Table 13b

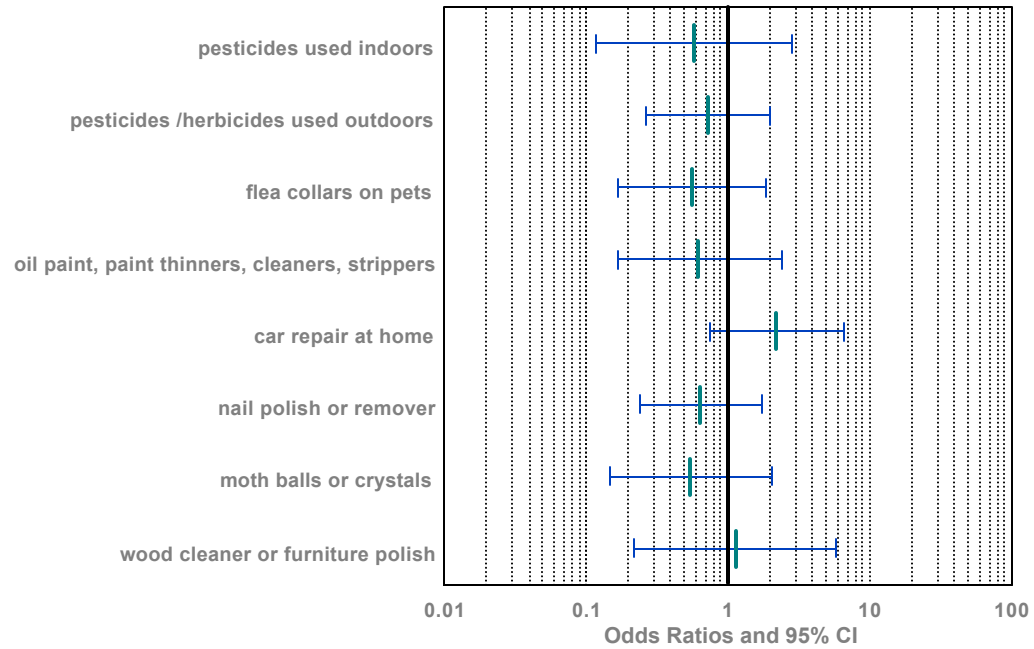
**Figure 5b: Interview Study Exposure to Tobacco Smoke and Alcohol**  
**Brain and Central Nervous System Cancers: Diagnosis Ages 0 - 19**



Data from Table 13d

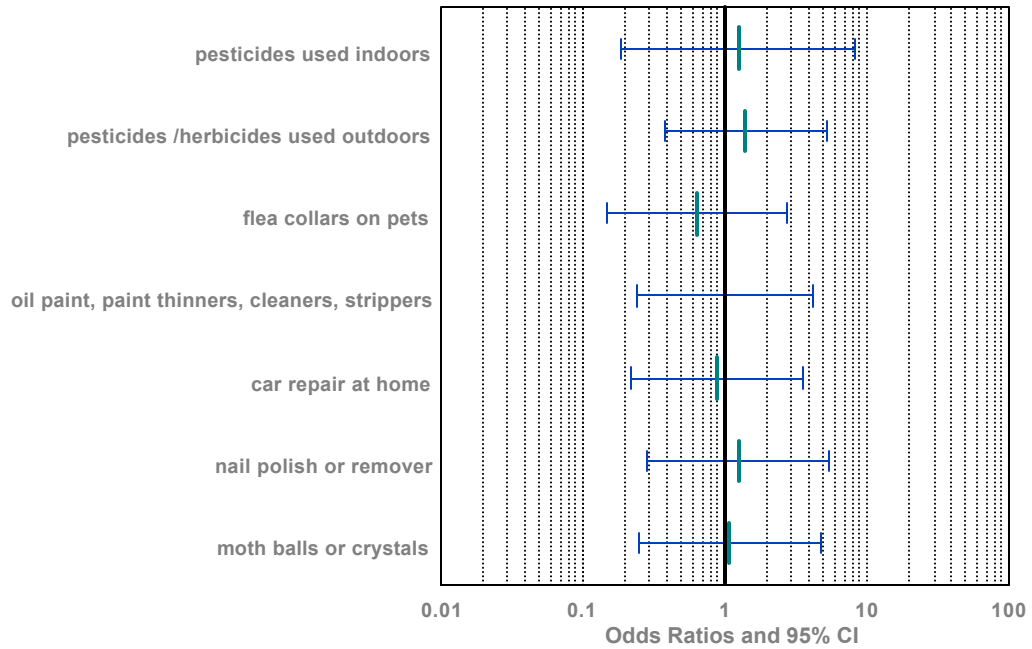
**Figure 6a: Interview Study Prenatal Household-related Exposures: Chemicals, Animals, and EMFs**

**Leukemia: Diagnosis Ages 0 - 19**



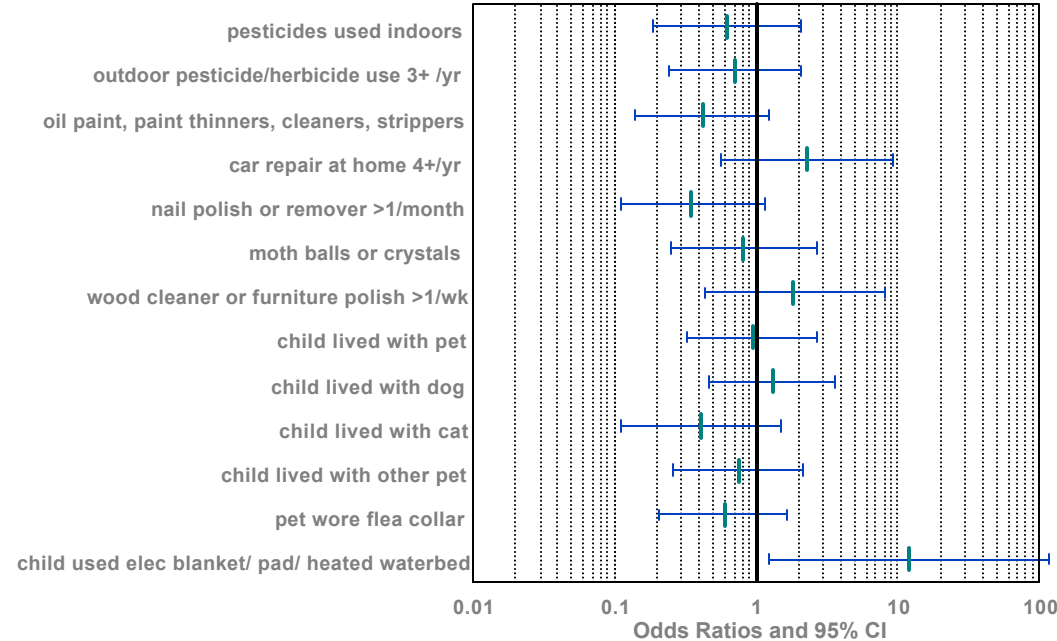
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**Figure 6b: Interview Study Prenatal Household-related Exposures: Chemicals, Animals, and EMFs**  
**Brain and Central Nervous System Cancers: Diagnosis Ages 0 - 19**



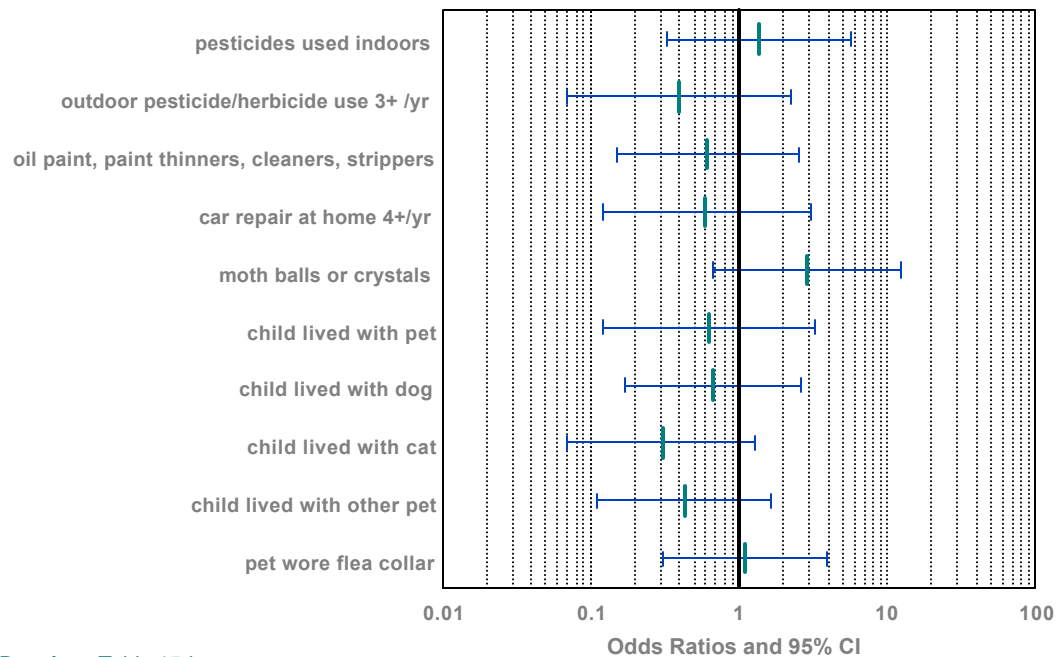
Data from Table 15d

**Figure 6c: Interview Study Postnatal Household-related Exposures: Chemicals, Animals, and EMFs**  
**Leukemia: Diagnosis Ages 0 - 19**



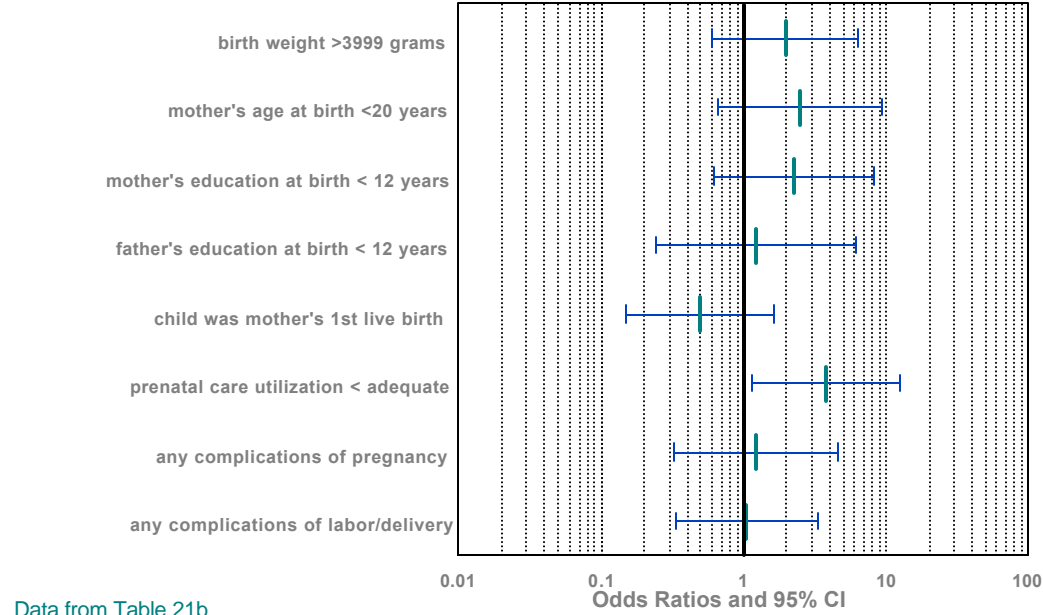
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**Figure 6d: Interview Study Postnatal Household-related Exposures: Chemicals, Animals, and EMFs**  
**Brain and Central Nervous System Cancers: Diagnosis Ages 0 - 19**

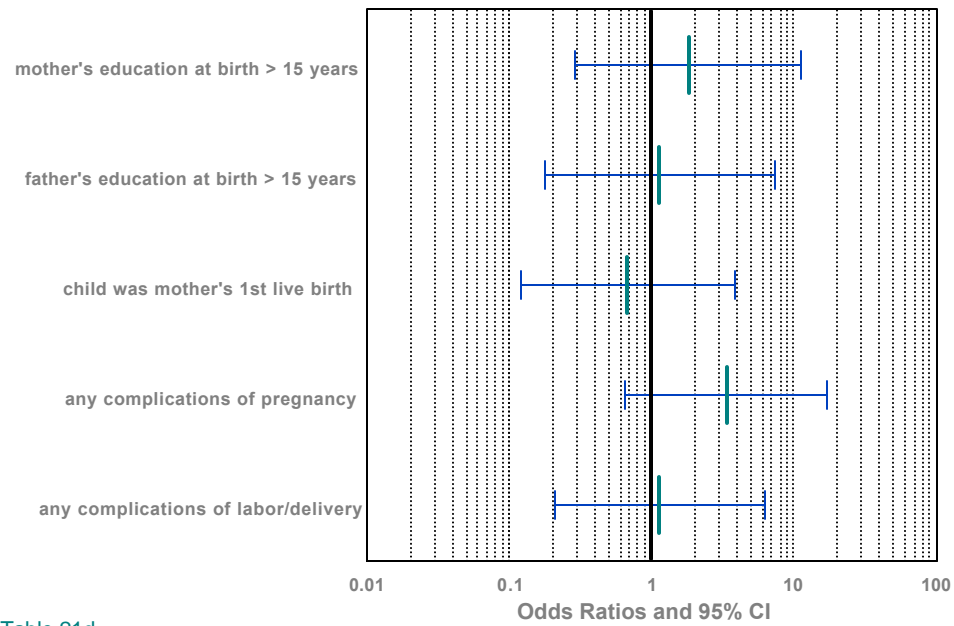


Data from Table 15d

**Figure 7a: Birth Records Study Demographic, Pregnancy and Birth Characteristics**  
**Leukemia: Diagnosis Ages 0 - 19**



**Figure 7b: Birth Records Study Demographic, Pregnancy and Birth Characteristics**  
**Brain and Central Nervous System Cancers: Diagnosis Ages 0 - 19**



Data from Table 21d



## **TABLES**

**Table 1. Interview Study Summary of Participant Recruitment**

<b>Status</b>	<b>Cases</b>	<b>Controls</b>
<b>Total number of recruitment attempts</b>	42	238
<b>Ineligible for participation:</b>		
Did not meet case definition	2	-
Matched case not eligible	-	8
Did not meet control definition	-	32
<b>Outcome of potentially eligible subjects:</b>		
Interviewed	40	159
Parent refusal	0	19
Subject refusal	0	0
No response after repeated attempts to contact	0	12
Unable to locate	0	7
Deceased/disabled parents	0	1
<b>Total number of potentially eligible subjects</b>	40	198
<b>Participation rate*</b>	100%	80.3%
<b>Overall study participation rate*</b>	83.6%	
<b>Number of the Initially Selected Controls per Case Interviewed</b>	<b>Number of Cases</b>	
4	18	
3	16	
2	6	
1	0	
0	0	

\* Participation Rate = 
$$\frac{\text{Interviewed}}{\text{Total number of potentially eligible subjects}}$$

**Table 2. Interview Study Number of Cases by Diagnosis Age and Cancer Type**

<b>Cancer Type</b>	<b>Age at Diagnosis</b>				<b>Total Cases by Type</b>	<b>Percent of All Studied Cancers</b>
	<b>0 - 4</b>	<b>5 - 9</b>	<b>10 - 14</b>	<b>15 - 19</b>		
Leukemia	9	5	3	5	22	55.0
Sympathetic nervous system cancer	5	0	0	0	5	12.5
Brain and central nervous system cancer	4	3	3	3	13	32.5
<b>Total</b>	18	8	6	8	40	

**Table 3. Interview Study Characteristics of the Interview**

<b>Characteristic</b>	<b>Cases (n=40)</b>		<b>Controls (n=159)</b>	
	<b>Number</b>	<b>Percent</b>	<b>Number</b>	<b>Percent</b>
<b>Number of interviews conducted by interviewer:</b>				
A	20	50.0	91	57.2
B	20	50.0	67	42.1
C	0	0	1	0.6
<b>Who was interviewed for mother's section:</b>				
Birth mother	38	95.0	148	93.1
Birth father	1	2.5	7	4.4
Adoptive/custodial parent	1	2.5	4	2.5
<b>Who was interviewed for father's section:</b>				
Birth mother	13	32.5	63	39.6
Birth father	25	62.5	92	57.9
Adoptive/custodial parent	2	5.0	4	2.5
<b>Type of Interview:</b>				
Telephone	39	97.5	159	100
In-person	1	2.5	0	0

**Table 4. Interview Study Demographic, Pregnancy, and Birth Characteristics**

<b>Characteristic</b>	<b>Cases (n=40)</b>		<b>Controls (n=159)</b>	
	<b>Number</b>	<b>Percent</b>	<b>Number</b>	<b>Percent</b>
<b>Gender of child:</b>				
Female	20	50.0	80	50.3
Male	20	50.0	79	49.7
<b>Race of child:</b>				
White	40	100	154	96.9
Non-white	0	0	5	3.1
<b>Hispanic origin of child:</b>				
Yes	1	2.5	3	1.9
No	39	97.5	155	97.5
Unknown	0	0	1	0.6
<b>Plurality of child:</b>				
Singleton	38	95.0	152	95.6
Twin	1	2.5	5	3.1
Unknown	1	2.5	2	1.3
<b>Mother's residence in Dover Township during pregnancy with study subject:</b>				
Entire pregnancy	21	52.5	70	44.0
Part of pregnancy	4	10.0	12	7.5
None of pregnancy	15	37.5	75	47.2
Unknown	0	0.0	2	1.3
<b>Length of child's residence in Dover Township from birth to end of relevant period:</b>				
< 1 year	7	17.5	20	12.6
1 - 5 years	16	40.0	61	38.4
> 5 - 10 years	11	27.5	52	32.7
> 10 - 15 years	3	7.5	17	10.7
> 15 years	3	7.5	9	5.7

Characteristic	Cases (n=40)		Controls (n=159)	
	Number	Percent	Number	Percent
<b>Percent of child's life lived in Dover Township from birth to end of relevant period:</b>				
100%	23	57.5	79	49.7
50% - < 100%	4	10.0	46	28.9
< 50%	13	32.5	34	21.4
<b>Average number of months in study (entire relevant time period)</b>	109.1		109.8	
<b>Number of maternal residences during the child's prenatal period:</b>				
1	31	77.5	123	77.4
2+	9	22.5	36	22.6
<b>Number of residences of child from birth to end of relevant period:</b>				
1	17	42.5	56	35.2
2 - 3	12	30.0	78	49.1
4+	11	27.5	25	15.7
<b>Number of day care, camp, and/or school locations child attended:</b>				
None	8	20.0	51	32.1
1 - 2	14	35.0	46	28.9
3+	17	42.5	62	39.0
Unknown	1	2.5	0	0
<b>Year of birth of child:</b>				
1963 - 69	6	15.0	20	12.6
1970 - 74	4	10.0	21	13.2
1975 - 79	7	17.5	32	20.1
1980 - 84	14	35.0	50	31.1
1985 - 89	5	12.5	21	13.2
1990 - 96	4	10.0	15	9.4

Table 4: page 2 of 5

Characteristic	Cases (n=40)		Controls (n=159)	
	Number	Percent	Number	Percent
<b>Age of child at end of relevant period:</b>				
0 - 4	18	45.0	65	40.9
5 - 9	8	20.0	38	23.9
10 - 14	6	15.0	28	17.6
15+	8	20.0	28	17.6
<b>Year at end of child's relevant period:</b>				
	7	17.5	27	17.0
1979 - 82	9	22.5	36	22.6
1983 - 86	12	30.0	48	30.2
1987 - 90	6	15.0	24	15.1
1991 - 94	6	15.0	24	15.1
1995 - 96				
<b>Mother's age at child's birth:</b>				
<20 years	2	5.0	11	6.9
20 - 34 years	35	87.5	128	80.5
>34 years	2	5.0	19	12.0
Unknown	1	2.5	1	0.6
<b>Mother's educational level:</b>				
< High school	2	5.0	10	6.3
High school	23	57.5	105	66.0
Some college	3	7.5	10	6.3
College graduate	10	25.0	23	14.5
Post-graduate	0	0	6	3.8
Unknown	2	5.0	5	3.1
<b>Father's educational level:</b>				
< High school	2	5.0	13	8.2
High school	24	60.0	77	48.4
Some college	3	7.5	13	8.2
College graduate	7	17.5	34	21.4
Post-graduate	2	5.0	17	10.7
Unknown	2	5.0	5	3.1
<b>Mother's pregnancies prior to child's birth:</b>				
0	12	30.0	54	34.0
1	9	22.5	45	28.3
2+	17	42.5	58	36.5
Unknown	2	5.0	2	1.3

Table 4: page 3 of 5

Characteristic	Cases (n=40)		Controls (n=159)	
	Number	Percent	Number	Percent
<b>Adverse pregnancy outcome (stillbirths; miscarriages; tubal, ectopic, or molar pregnancies) of mother prior to child's birth:</b>				
Yes	6	15.0	27	17.0
No	32	80.0	130	81.8
Unknown	2	5.0	2	1.3
<b>Any pregnancy termination of mother prior to child's birth:</b>				
Yes				
No	5	12.5	16	10.1
Unknown	33	82.5	141	88.7
	2	5.0	2	1.3
<b>Total number of pregnancies of mother:</b>				
1	3	7.5	6	3.8
2-3	17	42.5	89	56.0
4+	18	45.0	62	39.0
Unknown	2	5.0	2	1.3
<b>Total live births of mother:</b>				
1	4	10.0	11	6.9
2-3	23	57.5	115	72.3
4+	11	27.5	31	19.5
Unknown	2	5.0	2	1.3
<b>Total adverse pregnancy outcomes (stillbirths; miscarriages; tubal, ectopic, or molar pregnancies) of mother:</b>				
Yes	11	27.5	42	26.4
No	27	67.5	115	72.3
Unknown	2	5.0	2	1.3
<b>Pregnancy duration of child:</b>				
< 37 weeks	2	5.0	21	13.2
37 - 44 weeks	36	90.0	137	86.9
Unknown	2	5.0	1	0.6

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Characteristic	Cases (n=40)		Controls (n=159)	
	Number	Percent	Number	Percent
<b>Delivery method of child:</b>				
Vaginal	31	77.5	130	81.8
C-section	8	20.0	29	18.2
Unknown	1	2.5	0	0
<b>Child was first live birth of mother:</b>				
Yes	14	35.0	65	40.9
No	24	60.0	91	57.2
Unknown	2	5.0	3	1.9
<b>Child's birth weight:</b>				
<2500 grams	2	5.0	12	7.6
2500 - 3999 grams	31	77.5	128	80.5
>3999 grams	6	15.0	19	11.9
Unknown	1	2.5	0	0.0

**Table 5a. Interview Study Analysis of Demographic, Pregnancy, and Birth Characteristics:  
Leukemia and Nervous System Cancers**

<b>Exposure Factor</b>	<b>Exposure Level</b>	<b>Number of Cases</b>	<b>Number of Controls</b>	<b>Odds Ratio</b>	<b>95% Confidence Interval</b>
<b>Leukemia and Nervous System Cancer Diagnosis Ages 0 through 19</b>					
Mother's age at child's birth	20-34 years	35	128	1.0	-
	<20 years	2	11	0.65	0.14 - 3.04
	35+ years	2	19	0.34	0.07 - 1.63
Mother's educational level	High School	26	115	1.0	-
	< High School	2	10	0.81	0.16 - 4.04
	College+	10	29	1.51	0.65 - 3.47
Father's educational level	High School	27	90	1.0	-
	< High School	2	13	0.51	0.11 - 2.39
	College+	9	51	0.57	0.24 - 1.35
Child was mother's first live birth	No	24	91	1.0	-
	Yes	14	65	0.78	0.37 - 1.66
Child's birth weight	2500-3999gm	31	128	1.0	-
	<2500 grams	2	12	0.66	0.14 - 3.17
	4000+ grams	6	19	1.39	0.48 - 4.04
Adverse pregnancy outcome (stillbirths; miscarriages; tubal, ectopic, or molar pregnancies) of mother prior to child's birth	No	32	130	1.0	-
	Yes	6	27	0.93	0.33 - 2.65

Exposure Factor	Exposure Level	Number of Cases	Number of Controls	Odds Ratio	95% Confidence Interval
Mother's total live births equal to 4 or more	No Yes	27 11	126 31	1.0 1.62	- 0.73 - 3.61
Any pregnancy termination of mother prior to child's birth	No Yes	33 5	141 16	1.0 1.31	- 0.43 - 3.98
<b>Leukemia and Nervous System Cancer Diagnosis Ages 0 through 4</b>					
Mother's age at child's birth	20-34 years <20 years 35+ years	14 1 2	58 2 10	1.0 1.85 0.79	- 0.16 - 21.7 0.14 - 4.49
Mother's educational level	High School < High School College+	9 1 7	51 3 16	1.0 1.84 2.60	- 0.14 - 24.0 0.82 - 8.20
Father's educational level	High School < High School College+	13 0 5	45 2 23	1.0 0 0.71	- - 0.21 - 2.38
Child was mother's first live birth	No Yes	12 5	37 33	1.0 0.49	- 0.16 - 1.53
Child's birth weight	2500-3999gm <2500 grams 4000+ grams	12 1 4	56 4 11	1.0 1.12 1.83	- 0.11 - 11.7 0.46 - 7.31
Adverse pregnancy outcome (stillbirths; miscarriages; tubal, ectopic, or molar pregnancies) of mother prior to child's birth	No Yes	15 2	53 17	1.0 0.44	- 0.10 - 2.07

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<b>Exposure Factor</b>	<b>Exposure Level</b>	<b>Number of Cases</b>	<b>Number of Controls</b>	<b>Odds Ratio</b>	<b>95% Confidence Interval</b>
Mother's total live births equal to 4 or more	No	11	61	1.0	-
	Yes	6	9	3.63	1.08 - 12.2
Any pregnancy termination of mother prior to child's birth	No	15	60	1.0	-
	Yes	2	10	0.79	0.17 - 3.72

**Table 5b. Interview Study Analysis of Demographic, Pregnancy, and Birth Characteristics: Leukemia**

Exposure Factor	Exposure Level	Number of Cases	Number of Controls	Odds Ratio	95% Confidence Interval
<b>Leukemia Diagnosis Ages 0 through 19</b>					
Mother's age at child's birth	20-34 years	20	71	1.0	-
	<20 years	2	5	1.47	0.28 - 7.59
	35+ years	0	11	0	-
Mother's educational level	High School	15	60	1.0	-
	<High School	2	7	0.99	0.17 - 5.63
	College+	4	17	0.87	0.26 - 2.90
Father's educational level	High School	17	41	1.0	-
	<High School	0	9	0	-
	College+	3	34	0.20	0.05 - 0.76
Child was maternal first live birth	No	13	49	1.0	-
	Yes	8	37	0.73	0.26 - 2.05
Child's birth weight	2500-3999gm	17	67	1.0	-
	<2500 grams	1	9	0.42	0.05 - 3.61
	4000+ grams	4	12	1.36	0.37 - 4.94
Adverse pregnancy outcome (stillbirths; miscarriages; tubal, ectopic, or molar pregnancies) of mother prior to child's birth	No	18	74	1.0	-
	Yes	3	13	1.00	0.26 - 3.89
Mother's total live births equal to 4 or more	No	14	72	1.0	-
	Yes	7	15	2.13	0.77 - 5.93

<b>Exposure Factor</b>	<b>Exposure Level</b>	<b>Number of Cases</b>	<b>Number of Controls</b>	<b>Odds Ratio</b>	<b>95% Confidence Interval</b>
Any pregnancy termination of mother prior to child's birth	No Yes	17 4	77 10	1.0 1.93	- 0.47 - 7.86
<b>Leukemia Diagnosis Ages 0 through 4</b>					
Mother's age at child's birth	20-34 years <20 years 35+ years	8 1 0	24 1 6	1.0 3.46 0	- 0.22 - 55.8 -
Mother's educational level	High School <High School College+	6 1 2	25 2 8	1.0 2.04 1.06	- 0.10 - 41.8 0.18 - 6.36
Father's educational level	High School <High School College+	7 0 2	19 1 15	1.0 0 0.34	- - 0.06 - 2.01
Child was mother's first live birth	No Yes	6 3	16 19	1.0 0.43	- 0.09 - 2.01
Child's birth weight	2500-3999gm <2500 grams 4000+ grams	6 0 3	26 4 6	1.0 0 2.75	- - 0.41 - 18.4
Adverse pregnancy outcome (stillbirths; miscarriages; tubal, ectopic, or molar pregnancies) of mother prior to child's birth	No Yes	9 0	25 10	1.0 0	- -
Mother's total live births equal to 4 or more	No Yes	5 4	30 5	1.0 3.94	- 0.85 - 18.2

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<b>Exposure Factor</b>	<b>Exposure Level</b>	<b>Number of Cases</b>	<b>Number of Controls</b>	<b>Odds Ratio</b>	<b>95% Confidence Interval</b>
Any pregnancy termination of mother prior to child's birth	No	7	29	1.0	-
	Yes	2	6	1.36	0.26 - 7.20

**Table 5c. Interview Study Analysis of Demographic, Pregnancy, and Birth Characteristics:  
Nervous System Cancers**

<b>Exposure Factor</b>	<b>Exposure Level</b>	<b>Number of Cases</b>	<b>Number of Controls</b>	<b>Odds Ratio</b>	<b>95% Confidence Interval</b>
<b>Nervous System Cancer Diagnosis Ages 0 through 19</b>					
Mother's age at child's birth	20-34 years	15	57	1.0	-
	<20 years	0	6	0	-
	35+ years	2	8	0.85	0.14 - 5.15
Mother's educational level	High School	11	55	1.0	-
	<High School	0	3	0	-
	College+	6	12	3.03	0.88 - 10.5
Father's educational level	High School	10	49	1.0	-
	<High School	2	4	2.26	0.40 - 12.7
	College+	6	17	1.72	0.50 - 5.86
Child's was mother's first live birth	No	11	42	1.0	-
	Yes	6	28	0.85	0.28 - 2.52
Child's birth weight	2500-3999gm	14	61	1.0	-
	<2500 grams	1	3	1.37	0.14 - 13.2
	4000+ grams	2	7	1.43	0.21 - 9.57
Adverse pregnancy outcome (stillbirths; miscarriages; tubal, ectopic, or molar pregnancies) of mother prior to child's birth	No	14	56	1.0	-
	Yes	3	14	0.85	0.16 - 4.33
Mother's total live births equal to 4 or more	No	13	54	1.0	-
	Yes	4	16	1.07	0.29 - 3.97



Exposure Factor	Exposure Level	Number of Cases	Number of Controls	Odds Ratio	95% Confidence Interval
Any pregnancy termination of mother prior to child's birth	No	16	64	1.0	-
	Yes	1	6	0.67	0.08 - 5.54
<b>Nervous System Cancer Diagnosis Ages 0 through 4</b>					
Mother's age at child's birth	20-34 years	6	30	1.0	-
	<20 years	0	1	0	-
	35+ years	2	4	2.20	0.25 - 19.2
Mother's educational level	High School	3	26	1.0	-
	<High School	0	1	0	-
	College+	5	8	5.89	1.07 - 32.4
Father's educational level	High School	6	26	1.0	-
	<High School	0	1	0	-
	College+	3	8	1.59	0.29 - 8.73
Child was mother's first live birth	No	6	21	1.0	-
	Yes	2	14	0.57	0.11 - 3.06
Child's birth weight	2500-3999gm	6	30	1.0	-
	<2500 grams	1	0	-	-
	4000+ grams	1	5	1.28	0.11 - 14.8
Adverse pregnancy outcome (stillbirths; miscarriages; tubal, ectopic, or molar pregnancies) of mother prior to child's birth	No	6	28	1.0	-
	Yes	2	7	1.37	0.22 - 8.49
Mother's total live births equal to 4 or more	No	6	31	1.0	-
	Yes	2	4	3.15	0.43 - 23.4

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<b>Exposure Factor</b>	<b>Exposure Level</b>	<b>Number of Cases</b>	<b>Number of Controls</b>	<b>Odds Ratio</b>	<b>95% Confidence Interval</b>
Any pregnancy termination of mother prior to child's birth	No	8	31	1.0	-
	Yes	0	4	0	-

**Table 5d. Interview Study Analysis of Demographic, Pregnancy, and Birth Characteristics:  
Brain and Central Nervous System Cancers**

Exposure Factor	Exposure Level	Number of Cases	Number of Controls	Odds Ratio	95% Confidence Interval
<b>Brain and Central Nervous System Cancer Diagnosis Ages 0 through 19</b>					
Mother's age at child's birth	20-34 years	12	39	1.0	-
	<20 years	0	6	0	-
	35+ years	0	7	0	-
Mother's educational level	High School	9	42	1.0	-
	<High School	0	3	0	-
	College+	3	6	3.26	0.64 - 16.5
Father's educational level	High School	7	36	1.0	-
	<High School	2	4	2.33	0.41 - 13.4
	College+	4	11	1.94	0.43 - 8.71
Child was mother's first live birth	No	7	31	1.0	-
	Yes	5	20	1.14	0.31 - 4.19
Child's birth weight	2500-3999gm	10	45	1.0	-
	<2500 grams	1	3	1.39	0.14 - 13.6
	4000+ grams	1	4	1.71	0.08 - 38.2
Adverse pregnancy outcome (stillbirths; miscarriages; tubal, ectopic, or molar pregnancies) of mother prior to child's birth	No	10	41	1.0	-
	Yes	2	10	0.79	0.08 - 7.28
Mother's total live births equal to 4 or more	No	10	35	1.0	-
	Yes	2	16	0.40	0.07 - 2.22

Exposure Factor	Exposure Level	Number of Cases	Number of Controls	Odds Ratio	95% Confidence Interval
Any pregnancy termination of mother prior to child's birth	No	11	48	1.0	-
	Yes	1	3	1.33	0.14 - 12.8
<b>Brain and Central Nervous System Cancer Diagnosis Ages 0 through 4</b>					
Mother's age at child's birth	20-34 years	3	12	1.0	-
	<20 years	0	1	0	-
	35+ years	0	3	0	-
Mother's educational level	High School	1	13	1.0	-
	<High School	0	1	0	-
	College+	2	2	0	-
Father's educational level	High School	3	13	1.0	-
	<High School	0	1	0	-
	College+	1	2	2.12	0.13 - 35.4
Child was mother's first live birth	No	2	10	1.0	-
	Yes	1	6	1.00	0.07 - 13.7
Child's birth weight	2500-3999gm	2	14	1.0	-
	<2500 grams	1	0	-	-
	4000+ grams	0	2	0	-
Adverse pregnancy outcome (stillbirths; miscarriages; tubal, ectopic, or molar pregnancies) of mother prior to child's birth	No	2	13	1.0	-
	Yes	1	3	2.45	0.14 - 42.6
Mother's total live births equal to 4 or more	No	3	12	1.0	-
	Yes	0	4	0	-

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<b>Exposure Factor</b>	<b>Exposure Level</b>	<b>Number of Cases</b>	<b>Number of Controls</b>	<b>Odds Ratio</b>	<b>95% Confidence Interval</b>
Any pregnancy termination of mother prior to child's birth	No	3	15	1.0	-
	Yes	0	1	0	-

**Table 6. Interview Study Family Medical History**

Characteristic	Cases (n=40)		Controls (n=159)	
	Number	Percent	Number	Percent
<b>Self reported inherited health problem or birth defect in child:</b>				
Yes	1	2.5	4	2.5
No	37	92.5	153	96.2
Unknown	2	5.0	2	1.3
<b>Reported problem in child appears to be a definite birth defect:</b>				
Yes	0	0.0	1	0.6
No	38	95.0	156	98.1
Unknown	2	5.0	2	1.3
<b>Self reported inherited health problem or birth defect in any of child's siblings:</b>				
Yes	2	5.0	9	5.7
No	36	90.0	148	93.1
Unknown	2	5.0	2	1.3
<b>Reported problem in any of child's siblings appears to be a definite birth defect:</b>				
Yes	2	5.0	6	3.8
No	36	90.0	151	95.0
Unknown	2	5.0	2	1.3
<b>Family* history of any type of cancer:</b>				
Yes	26	65.0	108	67.9
No	11	27.5	47	29.6
Unknown	3	7.5	4	2.5
<b>Family* history of leukemia:</b>				
Yes	2	5.0	2	1.3
No	36	90.0	155	97.5
Unknown	2	5.0	2	1.3

Characteristic	Cases (n=40)		Controls (n=159)	
	Number	Percent	Number	Percent
<b>Family* history of brain tumors:</b>				
Yes	0	0.0	4	2.5
No	38	95.0	153	96.2
Unknown	2	5.0	2	1.3
<b>History of any cancer in grandparents:</b>				
Yes	26	65.0	108	67.9
No	12	30.0	49	30.8
Unknown	2	5.0	2	1.3
<b>History of any cancer in parents:</b>				
Yes	4	10.0	8	5.0
No	34	85.0	149	93.7
Unknown	2	5.0	2	1.3
<b>History of any cancer in siblings:</b>				
Yes	0	0.0	0	0.0
No	38	95.0	157	98.7
Unknown	2	5.0	2	1.3

**\* Note:** Family history includes subject's biological grandparents, parents and siblings.

**Table 7a. Interview Study Analysis of Family Medical History: Leukemia and Nervous System Cancers**

<b>Exposure Factor</b>	<b>Exposure Level</b>	<b>Number of Cases</b>	<b>Number of Controls</b>	<b>Odds Ratio</b>	<b>95% Confidence Interval</b>
<b>Leukemia and Nervous System Cancer Diagnosis Ages 0 through 19</b>					
Self reported inherited health problem or birth defect in child	No	37	153	1.0	-
	Yes	1	4	1.00	0.10 - 10.1
Reported problem in child appears to be a definite birth defect	No	38	156	1.0	-
	Yes	0	1	0	-
Self reported inherited health problem or birth defect in any of child's siblings	No	36	148	1.0	-
	Yes	2	9	0.86	0.18 - 4.11
Reported problem in any of child's siblings appears to be a definite birth defect	No	36	151	1.0	-
	Yes	2	6	1.36	0.26 - 7.20
Family history of any type of cancer	No	11	47	1.0	-
	Yes	26	108	0.97	0.44 - 2.17
Family history of leukemia	No	36	155	1.0	-
	Yes	2	2	4.00	0.56 - 28.4
Family history of brain tumors	No	38	153	1.0	-
	Yes	0	4	0	-
History of any cancer in grandparents	No	12	49	1.0	-
	Yes	26	108	0.95	0.44 - 2.03
History of any cancer in parents	No	34	149	1.0	-
	Yes	4	8	2.11	0.58 - 7.66



<b>Exposure Factor</b>	<b>Exposure Level</b>	<b>Number of Cases</b>	<b>Number of Controls</b>	<b>Odds Ratio</b>	<b>95% Confidence Interval</b>
History of any cancer in siblings	No Yes	38 0	157 0	1.0 -	- -
<b>Leukemia and Nervous System Cancer Diagnosis Ages 0 through 4</b>					
Self reported inherited health problem or birth defect in child	No Yes	16 1	68 2	1.0 2.45	- 0.14 - 42.6
Reported problem in child appears to be a definite birth defect	No Yes	17 0	70 0	1.0 -	- -
Self reported inherited health problem or birth defect in any of child's siblings	No Yes	16 1	67 3	1.0 1.33	- 0.14 - 12.8
Reported problem in any of child's siblings appears to be a definite birth defect	No Yes	16 1	68 2	1.0 2.00	- 0.18 - 22.1
Family history of any type of cancer	No Yes	4 12	23 46	1.0 1.41	- 0.39 - 5.01
Family history of leukemia	No Yes	17 0	69 1	1.0 0	- -
Family history of brain tumors	No Yes	17 0	68 2	1.0 0	- -
History of any cancer in grandparents	No Yes	5 12	24 46	1.0 1.17	- 0.37 - 3.70
History of any cancer in parents	No Yes	15 2	68 2	1.0 3.72	- 0.52 - 26.5

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<b>Exposure Factor</b>	<b>Exposure Level</b>	<b>Number of Cases</b>	<b>Number of Controls</b>	<b>Odds Ratio</b>	<b>95% Confidence Interval</b>
History of any cancer in siblings	No	17	70	1.0	-
	Yes	0	0	-	-

**Table 7b. Interview Study Analysis of Family Medical History: Leukemia**

<b>Exposure Factor</b>	<b>Exposure Level</b>	<b>Number of Cases</b>	<b>Number of Controls</b>	<b>Odds Ratio</b>	<b>95% Confidence Interval</b>
<b>Leukemia Diagnosis Ages 0 through 19</b>					
Self reported inherited health problem or birth defect in child	No	20	84	1.0	-
	Yes	1	3	1.40	0.12 - 16.4
Reported problem in child appears to be a definite birth defect	No	21	86	1.0	-
	Yes	0	1	0	-
Self reported inherited health problem or birth defect in any of child's siblings	No	19	83	1.0	-
	Yes	2	4	2.17	0.35 - 13.5
Reported problem in any of child's siblings appears to be a definite birth defect	No	19	83	1.0	-
	Yes	2	4	2.17	0.35 - 13.5
Family history of any type of cancer	No	7	24	1.0	-
	Yes	13	62	0.73	0.27 - 2.00
Family history of leukemia	No	20	86	1.0	-
	Yes	1	1	4.00	0.25 - 64.0
Family history of brain tumors	No	21	87	1.0	-
	Yes	0	0	-	-
History of any cancer in grandparents	No	8	25	1.0	-
	Yes	13	62	0.69	0.26 - 1.77

<b>Exposure Factor</b>	<b>Exposure Level</b>	<b>Number of Cases</b>	<b>Number of Controls</b>	<b>Odds Ratio</b>	<b>95% Confidence Interval</b>
History of any cancer in parents	No	19	80	1.0	-
	Yes	2	7	0.73	0.27 - 2.00
History of any cancer in siblings	No	21	87	1.0	-
	Yes	0	0	-	-
<b>Leukemia Diagnosis Ages 0 through 4</b>					
Self reported inherited health problem or birth defect in child	No	8	33	1.0	-
	Yes	1	2	2.45	0.14 - 42.6
Reported problem in child appears to be a definite birth defect	No	9	35	1.0	-
	Yes	0	0	-	-
Self reported inherited health problem or birth defect in any of child's siblings	No	8	34	1.0	-
	Yes	1	1	4.00	0.25 - 64.0
Reported problem in any of child's siblings appears to be a definite birth defect	No	8	34	1.0	-
	Yes	1	1	4.00	0.25 - 64.0
Family history of any type of cancer	No	3	11	1.0	-
	Yes	5	24	0.80	0.17 - 3.76
Family history of leukemia	No	9	35	1.0	-
	Yes	0	0	-	-
Family history of brain tumors	No	9	35	1.0	-
	Yes	0	0	-	-
History of any cancer in grandparents	No	4	11	1.0	-
	Yes	5	24	0.60	0.14 - 2.49

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<b>Exposure Factor</b>	<b>Exposure Level</b>	<b>Number of Cases</b>	<b>Number of Controls</b>	<b>Odds Ratio</b>	<b>95% Confidence Interval</b>
History of any cancer in parents	No	9	33	1.0	-
	Yes	0	2	0	-
History of any cancer in siblings	No	9	35	1.0	-
	Yes	0	0	-	-

**Table 7c. Interview Study Analysis of Family Medical History: Nervous System Cancers**

<b>Exposure Factor</b>	<b>Exposure Level</b>	<b>Number of Cases</b>	<b>Number of Controls</b>	<b>Odds Ratio</b>	<b>95% Confidence Interval</b>
<b>Nervous System Cancer Diagnosis Ages 0 through 19</b>					
Self reported inherited health problem or birth defect in child	No	17	69	1.0	-
	Yes	0	1	0	-
Reported problem in child appears to be a definite birth defect	No	17	70	1.0	-
	Yes	0	0	-	-
Self reported inherited health problem or birth defect in any of child's siblings	No	17	65	1.0	-
	Yes	0	5	0	-
Reported problem in any of child's siblings appears to be a definite birth defect	No	17	68	1.0	-
	Yes	0	2	0	-
Family history of any type of cancer	No	4	23	1.0	-
	Yes	13	46	1.53	0.42 - 5.67
Family history of leukemia	No	16	69	1.0	-
	Yes	1	1	4.00	0.25 - 64.0
Family history of brain tumors	No	17	66	1.0	-
	Yes	0	4	0	-
History of any cancer in grandparents	No	4	24	1.0	-
	Yes	13	46	1.63	0.45 - 5.88

<b>Exposure Factor</b>	<b>Exposure Level</b>	<b>Number of Cases</b>	<b>Number of Controls</b>	<b>Odds Ratio</b>	<b>95% Confidence Interval</b>
History of any cancer in parents	No	15	69	1.0	-
	Yes	2	1	7.29	0.66 - 80.8
History of any cancer in siblings	No	17	70	1.0	-
	Yes	0	0	-	-
<b>Nervous System Cancer Diagnosis Ages 0 through 4</b>					
Self reported inherited health problem or birth defect in child	No	8	35	1.0	-
	Yes	0	0	-	-
Reported problem in child appears to be a definite birth defect	No	8	35	1.0	-
	Yes	0	0	-	-
Self reported inherited health problem or birth defect in any of child's siblings	No	8	33	1.0	-
	Yes	0	2	0	-
Reported problem in any of child's siblings appears to be a definite birth defect	No	8	34	1.0	-
	Yes	0	1	0	-
Family history of any type of cancer	No	1	12	1.0	-
	Yes	7	22	3.93	0.36 - 42.4
Family history of leukemia	No	8	34	1.0	-
	Yes	0	1	0	-
Family history of brain tumors	No	8	33	1.0	-
	Yes	0	2	0	-
History of any cancer in grandparents	No	1	13	1.0	-
	Yes	7	22	4.27	0.41 - 44.0

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<b>Exposure Factor</b>	<b>Exposure Level</b>	<b>Number of Cases</b>	<b>Number of Controls</b>	<b>Odds Ratio</b>	<b>95% Confidence Interval</b>
History of any cancer in parents	No	6	35	1.0	-
	Yes	2	0	-	-
History of any cancer in siblings	No	8	35	1.0	-
	Yes	0	0	-	-



**Table 7d. Interview Study Analysis of Family Medical History: Brain and Central Nervous System Cancers**

<b>Exposure Factor</b>	<b>Exposure Level</b>	<b>Number of Cases</b>	<b>Number of Controls</b>	<b>Odds Ratio</b>	<b>95% Confidence Interval</b>
<b>Brain and Central Nervous System Cancer Diagnosis Ages 0 through 19</b>					
Self reported inherited health problem or birth defect in child	No	12	50	1.0	-
	Yes	0	1	0	-
Reported problem in child appears to be a definite birth defect	No	12	51	1.0	-
	Yes	0	0	-	-
Self reported inherited health problem or birth defect in any of child's siblings	No	12	47	1.0	-
	Yes	0	4	0	-
Reported problem in any of child's siblings appears to be a definite birth defect	No	12	49	1.0	-
	Yes	0	2	0	-
Family history of any type of cancer	No	3	16	1.0	-
	Yes	9	34	1.26	0.28 - 5.66
Family history of leukemia	No	11	51	1.0	-
	Yes	1	0	-	-
Family history of brain tumors	No	12	47	1.0	-
	Yes	0	4	0	-
History of any cancer in grandparents	No	3	17	1.0	-
	Yes	9	34	1.38	0.32 - 5.95

<b>Exposure Factor</b>	<b>Exposure Level</b>	<b>Number of Cases</b>	<b>Number of Controls</b>	<b>Odds Ratio</b>	<b>95% Confidence Interval</b>
History of any cancer in parents	No	11	50	1.0	-
	Yes	1	1	1.26	0.28 - 5.66
History of any cancer in siblings	No	12	51	1.0	-
	Yes	0	0	-	-
<b>Brain and Central Nervous System Cancer Diagnosis Ages 0 through 4</b>					
Self reported inherited health problem or birth defect in child	No	3	16	1.0	-
	Yes	0	0	-	-
Reported problem in child appears to be a definite birth defect	No	3	16	1.0	-
	Yes	0	0	-	-
Self reported inherited health problem or birth defect in any of child's siblings	No	3	15	1.0	-
	Yes	0	1	0	-
Reported problem in any of child's siblings appears to be a definite birth defect	No	3	15	1.0	-
	Yes	0	1	0	-
Family history of any type of cancer	No	0	5	-	-
	Yes	3	10	-	-
Family history of leukemia	No	3	16	1.0	-
	Yes	0	0	-	-
Family history of brain tumors	No	3	14	1.0	-
	Yes	0	2	0	-
History of any cancer in grandparents	No	0	6	-	-
	Yes	3	10	-	-

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<b>Exposure Factor</b>	<b>Exposure Level</b>	<b>Number of Cases</b>	<b>Number of Controls</b>	<b>Odds Ratio</b>	<b>95% Confidence Interval</b>
History of any cancer in parents	No	2	16	1.0	-
	Yes	1	0	-	-
History of any cancer in siblings	No	3	16	1.0	-
	Yes	0	0	-	-

**Table 8. Health, Medical Conditions and Medical Procedures**

Characteristic	Cases (n=40)		Controls (n=159)	
	Number	Percent	Number	Percent
<b>Prenatal Exposure</b>				
<b>Mother had measles during pregnancy:</b>				
Yes	0	0.0	0	0.0
No	38	95.0	156	98.1
Unknown	2	5.0	3	1.9
<b>Mother had rubella during pregnancy:</b>				
Yes	0	0.0	0	0.0
No	38	95.0	156	98.1
Unknown	2	5.0	3	1.9
<b>Mother had chickenpox during pregnancy:</b>				
Yes	0	0.0	0	0.0
No	38	95.0	156	98.1
Unknown	2	5.0	3	1.9
<b>Mother had cytomegalovirus during pregnancy:</b>				
Yes	0	0.0	0	0.0
No	38	95.0	156	98.1
Unknown	2	5.0	3	1.9
<b>Mother had fever &gt;100° for 3 or more days during pregnancy:</b>				
Yes	1	2.5	5	3.1
No	37	92.5	149	93.7
Unknown	2	5.0	5	3.1
<b>Mother had mononucleosis during pregnancy:</b>				
Yes	0	0.0	2	1.3
No	38	95.0	154	96.9
Unknown	2	5.0	3	1.9

Characteristic	Cases (n=40)		Controls (n=159)	
	Number	Percent	Number	Percent
<b>Mother had vaginal or uterine bleeding during pregnancy:</b>				
Yes	3	7.5	19	11.9
No	35	87.5	136	85.5
Unknown	2	5.0	4	2.5
<b>Mother had high blood pressure during pregnancy:</b>				
Yes	3	7.5	10	6.3
No	35	87.5	146	91.8
Unknown	2	5.0	3	1.9
<b>Mother had toxemia or pre-eclampsia during pregnancy:</b>				
Yes	1	2.5	8	5.0
No	37	92.5	148	93.1
Unknown	2	5.0	3	1.9
<b>Mother had protein in urine during pregnancy:</b>				
Yes	1	2.5	6	3.8
No	37	92.5	145	91.2
Unknown	2	5.0	8	5.0
<b>Mother had nausea or vomiting &gt; 3 months during pregnancy:</b>				
Yes	5	12.5	11	6.9
No	33	82.5	145	91.2
Unknown	2	5.0	3	1.9
<b>Mother had aplastic anemia, due to bone marrow defects during pregnancy:</b>				
Yes	0	0.0	0	0.0
No	38	95.0	156	98.1
Unknown	2	5.0	3	1.9
<b>Mother had other illnesses or complications during pregnancy:</b>				
Yes	9	22.5	29	18.2
No	29	72.5	129	81.1
Unknown	2	5.0	1	0.6

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Characteristic	Cases (n=40)		Controls (n=159)	
	Number	Percent	Number	Percent
<b>Mother took antibiotics for 5+ days during pregnancy:</b>				
Yes	5	12.5	23	14.5
No	31	77.5	130	81.8
Unknown	4	10.0	6	3.8
<b>Mother took steroids for 5+ days during pregnancy:</b>				
Yes	1	2.5	0	0.0
No	37	92.5	156	98.1
Unknown	2	5.0	3	1.9
<b>Mother had any vaccinations during pregnancy:</b>				
Yes	1	2.5	3	1.9
No	37	92.5	151	95.0
Unknown	2	5.0	5	3.1
<b>Mother had dental x-rays during pregnancy:</b>				
Yes	9	22.5	46	28.9
No	29	72.5	99	62.3
Unknown	2	5.0	14	8.8
<b>Mother had diagnostic x-rays or radiation therapy during pregnancy:</b>				
Yes	5	12.5	9	5.7
No	33	82.5	147	92.5
Unknown	2	5.0	3	1.9
<b><u>Mothers who had diagnostic x-rays:</u></b>				
Average total x-rays	1.0		1.1	
<b>Mother received blood or blood products during pregnancy:</b>				
Yes	0	0.0	1	0.6
No	38	95.0	155	97.5
Unknown	2	5.0	3	1.9

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Characteristic	Cases (n=40)		Controls (n=159)	
	Number	Percent	Number	Percent
<b>Postnatal Exposure</b>				
<b>Oxygen given to child immediately after birth:</b>				
Yes	2	5.0	8	5.0
No	37	92.5	148	93.1
Unknown	1	2.5	3	1.9
<b>Child had an IV tube immediately after birth:</b>				
Yes	1	2.5	8	5.0
No	38	95.0	149	93.7
Unknown	1	2.5	2	1.3
<b>Child was breast fed:</b>				
Yes	17	42.5	65	40.9
No	22	55.0	92	57.9
Unknown	1	2.5	2	1.3
<b><u>Children who were breast fed:</u></b>				
Average number of breast feeding months	9.6		6.8	
Mother took multivitamins for 5+ days while breast feeding:				
Yes	13	76.5	48	73.9
No	4	23.5	14	21.5
Unknown	0	0.0	3	4.6
Mother took antibiotics while breast feeding:				
Yes	0	0.0	5	7.7
No	16	94.1	59	90.8
Unknown	1	5.9	1	1.5
<b><i>Mother took steroids while breast feeding:</i></b>				
Yes	0	0.0	0	0.0
No	17	100.0	65	100.0
Unknown	0	0.0	0	0.0

Characteristic	Cases (n=40)		Controls (n=159)	
	Number	Percent	Number	Percent
<b>Mother received a vaccine while breast feeding:</b>				
Yes	0	0.0	2	3.1
No	17	100.0	63	96.9
Unknown	0	0.0	0	0.0
<b>Child had phototherapy immediately after birth:</b>				
Yes	9	22.5	37	23.3
No	29	72.5	117	73.6
Unknown	2	5.0	5	3.1
<b>Child had problems after birth, prior to leaving hospital:</b>				
Yes	4	10.0	19	11.9
No	35	87.5	140	88.1
Unknown	1	2.5	0	0.0
<b>Child had mononucleosis:</b>				
Yes	1	2.5	2	1.3
No	38	95.0	157	98.7
Unknown	1	2.5	0	0.0
<b>Child had chickenpox:</b>				
Yes	19	47.5	79	49.7
No	20	50.0	78	49.1
Unknown	1	2.5	2	1.3
<b>Child had rubella:</b>				
Yes	3	7.5	8	5.0
No	36	90.0	150	94.3
Unknown	1	2.5	1	0.6
<b>Child had measles:</b>				
Yes	4	10.0	28	17.6
No	35	87.5	130	81.8
Unknown	1	2.5	1	0.6
<b>Child had mumps:</b>				
Yes	2	5.0	12	7.6
No	37	92.5	147	92.5
Unknown	1	2.5	0	0.0

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Characteristic	Cases (n=40)		Controls (n=159)	
	Number	Percent	Number	Percent
<b>Child had cytomegalovirus:</b>				
Yes	0	0.0	0	0.0
No	39	97.5	159	100.0
Unknown	1	2.5	0	0.0
<b>Child had aplastic anemia:</b>				
Yes	0	0.0	0	0.0
No	38	95.0	159	100.0
Unknown	2	5.0	0	0.0
<b>Child had epilepsy, seizures or convulsions:</b>				
Yes	2	5.0	6	3.8
No	37	92.5	153	96.2
Unknown	1	2.5	0	0.0
<b>Child had autoimmune disorder:</b>				
Yes	1	2.5	1	0.6
No	38	95.0	158	99.4
Unknown	1	2.5	0	0.0
<b>Child had organ transplant:</b>				
Yes	0	0.0	0	0.0
No	39	97.5	159	100.0
Unknown	1	2.5	0	0.0
<b>Child had immunosuppression or recurring infections:</b>				
Yes	8	20.0	35	22.0
No	31	77.5	124	77.9
Unknown	1	2.5	0	0.0
<b>Child had severe head injury:</b>				
Yes	4	10.0	18	11.3
No	35	87.5	140	88.1
Unknown	1	2.5	1	0.6
<b>Child had other major illness:</b>				
Yes	16	40.0	43	27.0
No	23	57.5	116	73.0
Unknown	1	2.5	0	0.0

Table 8: page 6 of 8

Characteristic	Cases (n=40)		Controls (n=159)	
	Number	Percent	Number	Percent
<b>Child took antibiotics for 10+ days:</b>				
Yes	10	25.0	21	13.2
No	28	70.0	136	85.5
Unknown	2	5.0	2	1.3
<b>Child had DPT or DT immunization:</b>				
Yes	38	95.0	154	96.9
No	1	2.5	5	3.1
Unknown	1	2.5	0	0.0
<b>Child had mumps immunization:</b>				
Yes	33	82.5	135	84.9
No	5	12.5	13	8.2
Unknown	2	5.0	11	6.9
<b>Child had rubella immunization:</b>				
Yes	34	85.0	146	91.8
No	5	12.5	8	5.0
Unknown	1	2.5	5	3.1
<b>Child had chickenpox immunization:</b>				
Yes	5	12.5	32	20.1
No	34	85.0	121	76.1
Unknown	1	2.5	6	3.8
<b>Child had measles immunization:</b>				
Yes	31	77.5	139	87.4
No	8	20.0	14	8.8
Unknown	1	2.5	6	3.8
<b>Child had polio immunization:</b>				
Yes	37	92.5	150	94.3
No	2	5.0	7	4.4
Unknown	1	2.5	2	1.3
<b>Child had diagnostic x-rays:</b>				
Yes	15	37.5	41	25.8
No	24	60.0	117	73.6
Unknown	1	2.5	1	0.6
<b><u>Children who had diagnostic x-rays:</u></b> Average total x-rays	1.4		1.4	

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Characteristic	Cases (n=40)		Controls (n=159)	
	Number	Percent	Number	Percent
<b>Child had dental x-rays:</b>				
Yes	19	47.5	84	52.8
No	20	50.0	73	45.9
Unknown	1	2.5	2	1.3
<b>Child had transfusion:</b>				
Yes	1	2.5	2	1.3
No	38	95.0	157	98.7
Unknown	1	2.5	0	0.0

**Table 9a. Interview Study Analysis of Health, Medical Conditions and Medical Procedures:  
Leukemia and Nervous System Cancers**

<b>Exposure Factor</b>	<b>Exposure Level</b>	<b>Number of Cases</b>	<b>Number of Controls</b>	<b>Odds Ratio</b>	<b>95% Confidence Interval</b>
<b>Prenatal Exposure: Leukemia and Nervous System Cancer Diagnosis Ages 0 through 19</b>					
Mother had fever > 100° for 3 or more days during pregnancy	No	37	149	1.0	-
	Yes	1	5	0.76	0.09 - 6.51
Mother had vaginal or uterine bleeding during pregnancy	No	35	136	1.0	-
	Yes	3	19	0.60	0.17 - 2.11
Mother had high blood pressure during pregnancy	No	35	146	1.0	-
	Yes	3	10	1.18	0.32 - 4.41
Mother had toxemia or pre-eclampsia during pregnancy	No	37	148	1.0	-
	Yes	1	8	0.48	0.06 - 4.01
Mother had protein in urine during pregnancy	No	37	145	1.0	-
	Yes	1	6	0.61	0.07 - 5.08
Mother had nausea or vomiting >3 months during pregnancy	No	33	145	1.0	-
	Yes	5	11	1.90	0.60 - 6.02
Mother had other illnesses or complications during pregnancy	No	29	129	1.0	-
	Yes	9	29	1.30	0.55 - 3.10
Mother took antibiotics for 5+ days during pregnancy	No	31	130	1.0	-
	Yes	5	23	0.81	0.29 - 2.27
Mother had any vaccinations during pregnancy	No	37	151	1.0	-
	Yes	1	3	1.24	0.13 - 11.9
Mother had dental x-rays during pregnancy	No	29	99	1.0	-
	Yes	9	46	0.65	0.28 - 1.49

<b>Exposure Factor</b>	<b>Exposure Level</b>	<b>Number of Cases</b>	<b>Number of Controls</b>	<b>Odds Ratio</b>	<b>95% Confidence Interval</b>
Mother had diagnostic x-rays or radiation therapy during pregnancy	No	33	147	1.0	-
	Yes	5	9	2.50	0.79 - 7.98
<b>Postnatal Exposure: Leukemia and Nervous System Cancer Diagnosis Ages 0 through 19</b>					
Oxygen given to child immediately after birth	No	37	148	1.0	-
	Yes	2	8	0.97	0.20 - 4.74
Child had IV tube immediately after birth	No	38	149	1.0	-
	Yes	1	8	0.48	0.06 - 4.01
Child had phototherapy immediately after birth	No	29	117	1.0	-
	Yes	9	37	0.93	0.39 - 2.18
Child had problems after birth, prior to leaving hospital	No	35	140	1.0	-
	Yes	4	19	0.86	0.27 - 2.74
Child was breast fed	No	22	92	1.0	-
	Yes	17	65	1.15	0.56 - 2.35
Mother took multivitamins for 5+ days while breast feeding	No	4	15	1.0	-
	Yes	13	48	0.79	0.21 - 3.00
Child had mononucleosis	No	38	157	1.0	-
	Yes	1	2	2.00	0.18 - 22.1
Child had chickenpox	No	20	78	1.0	-
	Yes	19	79	0.82	0.33 - 2.05
Child had rubella	No	36	150	1.0	-
	Yes	3	8	1.80	0.31 - 10.6
Child had measles	No	35	130	1.0	-
	Yes	4	28	0.42	0.12 - 1.46

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<b>Exposure Factor</b>	<b>Exposure Level</b>	<b>Number of Cases</b>	<b>Number of Controls</b>	<b>Odds Ratio</b>	<b>95% Confidence Interval</b>
Child had mumps	No	37	147	1.0	-
	Yes	2	12	0.58	0.11 - 3.16
Child had epilepsy, seizures or convulsions	No	37	153	1.0	-
	Yes	2	6	1.40	0.25 - 7.97
Child had autoimmune disorder	No	38	158	1.0	-
	Yes	1	1	4.00	0.25 - 64.0
Child had immunosuppression or recurring infections	No	31	124	1.0	-
	Yes	8	35	0.88	0.35 - 2.21
Child had severe head injury	No	35	140	1.0	-
	Yes	4	18	0.87	0.28 - 2.69
Child had other major illnesses	No	23	116	1.0	-
	Yes	16	43	1.93	0.91 - 4.08
Child took antibiotics for 10 days or more	No	28	136	1.0	-
	Yes	10	21	2.37	1.02 - 5.54
Child had DPT or DT immunization	No	1	5	1.0	-
	Yes	38	154	1.35	0.15 - 12.4
Child had mumps immunization	No	5	13	1.0	-
	Yes	33	135	0.72	0.17 - 3.15
Child had rubella immunization	No	5	8	1.0	-
	Yes	34	146	0.23	0.04 - 1.38
Child had chickenpox immunization	No	34	121	1.0	-
	Yes	5	32	0.57	0.21 - 1.55
Child had measles immunization	No	8	14	1.0	-
	Yes	31	139	0.37	0.12 - 1.14

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<b>Exposure Factor</b>	<b>Exposure Level</b>	<b>Number of Cases</b>	<b>Number of Controls</b>	<b>Odds Ratio</b>	<b>95% Confidence Interval</b>
Child had polio immunization	No	2	7	1.0	-
	Yes	37	150	1.05	0.15 - 7.54
Child had dental x-rays	No	20	73	1.0	-
	Yes	19	84	0.44	0.12 - 1.69
Child had diagnostic x-rays or radiation therapy	No	24	117	1.0	-
	Yes	15	41	1.78	0.85 - 3.73
Child had diagnostic x-rays or radiation therapy, excluding those received within 1 year of diagnosis	No	30	123	1.0	-
	Yes	9	35	1.05	0.43 - 2.55
Child's total number of diagnostic x-rays or radiation therapy	None	24	117	1.0	-
	1	10	29	1.65	0.72 - 3.76
	>1	5	12	2.20	0.65 - 7.41
Child's total number of diagnostic x-rays or radiation therapy, excluding those received within 1 year of diagnosis	None	30	123	1.0	-
	1	6	24	1.03	0.38 - 2.77
	>1	3	11	1.13	0.26 - 4.93
Child had transfusion	No	38	157	1.0	-
	Yes	1	2	2.00	0.18 - 22.1
<b>Prenatal Exposure: Leukemia and Nervous System Cancer Diagnosis Ages 0 through 4</b>					
Mother had fever >100° for 3 or more days during pregnancy	No	16	65	1.0	-
	Yes	1	5	0.76	0.09 - 6.51
Mother had vaginal or uterine bleeding during pregnancy	No	14	59	1.0	-
	Yes	3	10	1.20	0.30 - 4.78

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<b>Exposure Factor</b>	<b>Exposure Level</b>	<b>Number of Cases</b>	<b>Number of Controls</b>	<b>Odds Ratio</b>	<b>95% Confidence Interval</b>
Mother had high blood pressure during pregnancy	No	15	65	1.0	-
	Yes	2	5	1.53	0.30 - 7.91
Mother had toxemia or pre-eclampsia during pregnancy	No	16	66	1.0	-
	Yes	1	4	1.00	0.10 - 10.1
Mother had protein in urine during pregnancy	No	16	64	1.0	-
	Yes	1	4	0.94	0.10 - 8.43
Mother had nausea or vomiting >3 months during pregnancy	No	14	67	1.0	-
	Yes	3	3	4.76	0.76 - 29.9
Mother had other illnesses or complications during pregnancy	No	12	57	1.0	-
	Yes	5	13	1.71	0.50 - 5.82
Mother had antibiotics for 5+ days during pregnancy	No	13	56	1.0	-
	Yes	4	13	1.22	0.36 - 4.05
Mother had any vaccinations during pregnancy	No	16	68	1.0	-
	Yes	1	2	2.00	0.18 - 22.1
Mother had dental x-rays during pregnancy	No	13	40	1.0	-
	Yes	4	24	0.49	0.14 - 1.69
Mother had diagnostic x-rays or radiation therapy during pregnancy	No	15	66	1.0	-
	Yes	2	4	2.67	0.45 - 16.0
<b>Postnatal Exposure: Leukemia and Nervous System Cancer Diagnosis Ages 0 through 4</b>					
Oxygen given to child immediately after birth	No	15	65	1.0	-
	Yes	2	4	1.90	0.35 - 10.4
Child had IV tube immediately after birth	No	16	66	1.0	-
	Yes	1	4	1.00	0.11 - 8.95

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<b>Exposure Factor</b>	<b>Exposure Level</b>	<b>Number of Cases</b>	<b>Number of Controls</b>	<b>Odds Ratio</b>	<b>95% Confidence Interval</b>
Child had phototherapy immediately after birth	No	12	48	1.0	-
	Yes	5	20	0.95	0.30 - 2.97
Child had problems after birth, prior to leaving hospital	No	14	59	1.0	-
	Yes	3	12	1.08	0.26 - 4.45
Child was breast fed	No	8	35	1.0	-
	Yes	9	35	1.18	0.44 - 3.17
Mother took multivitamins for 5+ days while breast feeding	No	3	6	1.0	-
	Yes	6	27	0.23	0.02 - 2.25
Child had mononucleosis	No	17	71	1.0	-
	Yes	0	0	-	-
Child had chickenpox	No	13	63	1.0	-
	Yes	4	7	3.11	0.63 - 15.3
Child had rubella	No	17	71	1.0	-
	Yes	0	0	-	-
Child had measles	No	17	71	1.0	-
	Yes	0	0	-	-
Child had mumps	No	17	71	1.0	-
	Yes	0	0	-	-
Child had epilepsy, seizures or convulsions	No	16	70	1.0	-
	Yes	1	1	0	-
Child had autoimmune disorder	No	17	70	1.0	-
	Yes	0	1	0	-
Child had immunosuppression or recurring infections	No	13	59	1.0	-
	Yes	4	12	1.57	0.37 - 6.67

Table 9: page 6 of 32

<b>Exposure Factor</b>	<b>Exposure Level</b>	<b>Number of Cases</b>	<b>Number of Controls</b>	<b>Odds Ratio</b>	<b>95% Confidence Interval</b>
Child had severe head injury	No	15	67	1.0	-
	Yes	2	4	2.00	0.37 - 10.9
Child had other major illnesses	No	11	57	1.0	-
	Yes	6	14	2.50	0.71 - 8.73
Child took antibiotics for 10 days or more	No	11	61	1.0	-
	Yes	6	9	4.35	1.17 - 16.1
Child had DPT or DT immunization	No	1	4	1.0	-
	Yes	16	67	1.07	0.11 - 10.7
Child had mumps immunization	No	3	8	1.0	-
	Yes	14	55	1.07	0.11 - 10.7
Child had rubella immunization	No	3	7	1.0	-
	Yes	14	61	0.52	0.06 - 4.39
Child had chickenpox immunization	No	14	56	1.0	-
	Yes	3	10	1.22	0.30 - 5.00
Child had measles immunization	No	3	9	1.0	-
	Yes	14	56	1.35	0.15 - 12.4
Child had polio immunization	No	2	6	1.0	-
	Yes	15	63	0.84	0.10 - 7.08
Child had dental x-rays	No	16	65	1.0	-
	Yes	1	5	0.74	0.08 - 6.87
Child had diagnostic x-rays or radiation therapy	No	8	57	1.0	-
	Yes	9	13	4.67	1.49 - 14.6

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<b>Exposure Factor</b>	<b>Exposure Level</b>	<b>Number of Cases</b>	<b>Number of Controls</b>	<b>Odds Ratio</b>	<b>95% Confidence Interval</b>
Child had diagnostic x-rays or radiation therapy, excluding those received within 1 year of diagnosis	No	14	60	1.0	-
	Yes	3	10	1.36	0.28 - 6.70
Child's total number of diagnostic x-rays or radiation therapy	None	8	57	1.0	-
	1	7	10	5.13	1.40 - 18.8
	>1	2	3	3.75	0.58 - 24.1
Child's total number of diagnostic x-rays or radiation therapy, excluding those received within 1 year of diagnosis	None	14	60	1.0	-
	1	3	8	1.75	0.34 - 9.05
	>1	0	2	0	-
Child had transfusion	No	16	69	1.0	-
	Yes	1	2	2.00	0.18 - 22.1

**Table 9b. Interview Study Analysis of Health, Medical Conditions and Medical Procedures:  
Leukemia**

<b>Exposure Factor</b>	<b>Exposure Level</b>	<b>Number of Cases</b>	<b>Number of Controls</b>	<b>Odds Ratio</b>	<b>95% Confidence Interval</b>
<b>Prenatal Exposure: Leukemia Diagnosis Ages 0 through 19</b>					
Mother had fever > 100 ° for 3 or more days during pregnancy	No	21	81	1.0	-
	Yes	0	3	0	-
Mother had vaginal or uterine bleeding during pregnancy	No	20	74	1.0	-
	Yes	1	12	0.31	0.04 - 2.50
Mother had high blood pressure during pregnancy	No	19	79	1.0	-
	Yes	2	7	1.15	0.23 - 5.83
Mother had toxemia or pre-eclampsia during pregnancy	No	21	84	1.0	-
	Yes	0	2	0	-
Mother had protein in urine during pregnancy	No	21	79	1.0	-
	Yes	0	4	0	-
Mother had nausea or vomiting > 3 months during pregnancy	No	17	79	1.0	-
	Yes	4	7	2.57	0.67 - 9.83
Mother had other illnesses or complications during pregnancy	No	19	72	1.0	-
	Yes	2	15	0.47	0.09 - 2.30
Mother had antibiotics for 5+ days during pregnancy	No	19	72	1.0	-
	Yes	1	11	0.33	0.04 - 2.68
Mother had any vaccinations during pregnancy	No	21	84	1.0	-
	Yes	0	1	0	-
Mother had dental x-rays during pregnancy	No	18	57	1.0	-
	Yes	3	25	0.38	0.10 - 1.38

<b>Exposure Factor</b>	<b>Exposure Level</b>	<b>Number of Cases</b>	<b>Number of Controls</b>	<b>Odds Ratio</b>	<b>95% Confidence Interval</b>
Mother had diagnostic x-rays or radiation therapy during pregnancy	No	17	80	1.0	-
	Yes	4	6	2.78	0.73 - 10.5
<b>Postnatal Exposure: Leukemia Diagnosis Ages 0 through 19</b>					
Oxygen given to child immediately after birth	No	22	80	1.0	-
	Yes	0	5	0	-
Child had IV tube immediately after birth	No	22	82	1.0	-
	Yes	0	5	0	-
Child had phototherapy immediately after birth	No	16	66	1.0	-
	Yes	5	18	1.15	0.33 - 3.99
Child had problems after birth, prior to leaving hospital	No	20	77	1.0	-
	Yes	2	11	0.69	0.14 - 3.47
Child was breast fed	No	14	50	1.0	-
	Yes	8	37	0.77	0.30 - 2.02
Mother took multivitamins for 5+ days while breast feeding	No	3	10	1.0	-
	Yes	5	25	0.50	0.08 - 3.07
Child had mononucleosis	No	21	87	1.0	-
	Yes	1	1	4.00	0.25 - 64.0
Child had chickenpox	No	11	42	1.0	-
	Yes	11	45	0.88	0.27 - 2.88
Child had rubella	No	21	85	1.0	-
	Yes	1	3	1.40	0.12 - 16.4
Child had measles	No	21	72	1.0	-
	Yes	1	16	0.15	0.02 - 1.37

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<b>Exposure Factor</b>	<b>Exposure Level</b>	<b>Number of Cases</b>	<b>Number of Controls</b>	<b>Odds Ratio</b>	<b>95% Confidence Interval</b>
Child had mumps	No	21	82	1.0	-
	Yes	1	6	0.53	0.04 - 6.68
Child had epilepsy, seizures or convulsions	No	22	86	1.0	-
	Yes	0	2	0	-
Child had autoimmune disorder	No	21	88	1.0	-
	Yes	1	0	-	-
Child had immunosuppression or recurring infections	No	16	63	1.0	-
	Yes	6	25	0.94	0.32 - 2.79
Child had severe head injury	No	20	72	1.0	-
	Yes	2	15	0.49	0.10 - 2.28
Child had other major illnesses	No	11	62	1.0	-
	Yes	11	26	2.38	0.91 - 6.23
Child took antibiotics for 10 days or more	No	15	72	1.0	-
	Yes	7	15	2.13	0.77 - 5.93
Child had DPT or DT immunization	No	0	0	-	-
	Yes	22	88	-	-
Child had mumps immunization	No	2	3	1.0	-
	Yes	20	81	0.37	0.05 - 2.86
Child had rubella immunization	No	2	1	1.0	-
	Yes	20	86	0.14	0.01 - 1.52
Child had chickenpox immunization	No	19	62	1.0	-
	Yes	3	21	0.50	0.14 - 1.74
Child had measles immunization	No	3	3	1.0	-
	Yes	19	83	0.21	0.03 - 1.30

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<b>Exposure Factor</b>	<b>Exposure Level</b>	<b>Number of Cases</b>	<b>Number of Controls</b>	<b>Odds Ratio</b>	<b>95% Confidence Interval</b>
Child had polio immunization	No	1	0	-	-
	Yes	21	88	-	-
Child had dental x-rays	No	11	36	1.0	-
	Yes	11	50	0.37	0.07 - 2.12
Child had diagnostic x-rays or radiation therapy	No	12	61	1.0	-
	Yes	10	26	2.02	0.75 - 5.44
Child had diagnostic x-rays or radiation therapy, excluding those received within 1 year of diagnosis	No	14	63	1.0	-
	Yes	8	24	1.51	0.54 - 4.21
Child's total number of diagnostic x-rays or radiation therapy	None	12	61	1.0	-
	1	7	16	2.21	0.73 - 6.67
	>1	3	10	1.64	0.36 - 7.51
Child's total number of diagnostic x-rays or radiation therapy, excluding those received within 1 year of diagnosis	None	14	63	1.0	-
	1	5	15	1.45	0.45 - 4.66
	>1	3	9	1.64	0.33 - 8.13
Child had transfusion	No	21	87	1.0	-
	Yes	1	1	4.00	0.25 - 64.0
<b>Prenatal Exposure: Leukemia Diagnosis Ages 0 through 4</b>					
Mother had fever >100 ° for 3 or more days during pregnancy	No	9	32	1.0	-
	Yes	0	3	0	-
Mother had vaginal or uterine bleeding during pregnancy	No	8	30	1.0	-
	Yes	1	5	0.77	0.08 - 7.76
Mother had high blood pressure during pregnancy	No	8	33	1.0	-
	Yes	1	2	2.00	0.18 - 22.1

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<b>Exposure Factor</b>	<b>Exposure Level</b>	<b>Number of Cases</b>	<b>Number of Controls</b>	<b>Odds Ratio</b>	<b>95% Confidence Interval</b>
Mother had toxemia or pre-eclampsia during pregnancy	No	9	34	1.0	-
	Yes	0	1	0	-
Mother had protein in urine during pregnancy	No	9	30	1.0	-
	Yes	0	3	0	-
Mother had nausea or vomiting >3 months during pregnancy	No	7	34	1.0	-
	Yes	2	1	8.00	0.73 - 88.2
Mother had other illnesses or complications during pregnancy	No	9	31	1.0	-
	Yes	0	4	0	-
Mother had antibiotics for 5+ days during pregnancy	No	8	28	1.0	-
	Yes	1	6	0.62	0.07 - 5.44
Mother had any vaccinations during pregnancy	No	9	34	1.0	-
	Yes	0	1	0	-
Mother had dental x-rays during pregnancy	No	8	23	1.0	-
	Yes	1	11	0.27	0.03 - 2.32
Mother had diagnostic x-rays or radiation therapy during pregnancy	No	7	33	1.0	-
	Yes	2	2	4.00	0.56 - 28.4
<b>Postnatal Exposure: Leukemia Diagnosis Ages 0 through 4</b>					
Oxygen given to child immediately after birth	No	9	32	1.0	-
	Yes	0	2	0	-
Child had IV tube immediately after birth	No	9	33	1.0	-
	Yes	0	2	0	-
Child had phototherapy immediately after birth	No	7	23	1.0	-
	Yes	2	10	0.71	0.12 - 4.09

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<b>Exposure Factor</b>	<b>Exposure Level</b>	<b>Number of Cases</b>	<b>Number of Controls</b>	<b>Odds Ratio</b>	<b>95% Confidence Interval</b>
Child had problems after birth, prior to leaving hospital	No	8	29	1.0	-
	Yes	1	7	0.49	0.05 - 4.93
Child was breast fed	No	6	17	1.0	-
	Yes	3	18	0.52	0.13 - 2.18
Mother took multivitamins for 5+ days while breast feeding	No	2	4	1.0	-
	Yes	1	12	0	-
Child had mononucleosis	No	9	36	1.0	-
	Yes	0	0	-	-
Child had chickenpox	No	6	33	1.0	-
	Yes	3	3	7.81	0.77 - 78.8
Child had rubella	No	9	36	1.0	-
	Yes	0	0	-	-
Child had measles	No	9	36	1.0	-
	Yes	0	0	-	-
Child had mumps	No	9	36	1.0	-
	Yes	0	0	-	-
Child had epilepsy, seizures or convulsions	No	9	36	1.0	-
	Yes	0	0	-	-
Child had autoimmune disorder	No	9	36	1.0	-
	Yes	0	0	-	-
Child had immunosuppression or recurring infections	No	6	25	1.0	-
	Yes	3	11	1.16	0.22 - 6.09
Child had severe head injury	No	8	32	1.0	-
	Yes	1	4	1.00	0.11 - 8.95

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<b>Exposure Factor</b>	<b>Exposure Level</b>	<b>Number of Cases</b>	<b>Number of Controls</b>	<b>Odds Ratio</b>	<b>95% Confidence Interval</b>
Child had other major illnesses	No	5	28	1.0	-
	Yes	4	8	2.81	0.59 - 13.5
Child took antibiotics for 10 days or more	No	5	29	1.0	-
	Yes	4	7	3.27	0.68 - 15.7
Child had DPT or DT immunization	No	0	0	-	-
	Yes	9	36	-	-
Child had mumps immunization	No	1	1	1.0	-
	Yes	8	33	0.25	0.02 - 4.00
Child had rubella immunization	No	1	1	1.0	-
	Yes	8	35	0.25	0.02 - 4.00
Child had chickenpox immunization	No	7	24	1.0	-
	Yes	2	8	0.85	0.16 - 4.48
Child had measles immunization	No	1	1	1.0	-
	Yes	8	33	0.29	0.02 - 4.65
Child had polio immunization	No	1	0	-	-
	Yes	8	36	-	-
Child had dental x-rays	No	8	31	1.0	-
	Yes	1	4	0.93	0.09 - 9.34
Child had diagnostic x-rays or radiation therapy	No	4	26	1.0	-
	Yes	5	9	3.46	0.75 - 16.0
Child had diagnostic x-rays or radiation therapy, excluding those received within 1 year of diagnosis	No	6	27	1.0	-
	Yes	3	8	1.64	0.31 - 8.74

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<b>Exposure Factor</b>	<b>Exposure Level</b>	<b>Number of Cases</b>	<b>Number of Controls</b>	<b>Odds Ratio</b>	<b>95% Confidence Interval</b>
Child's total number of diagnostic x-rays or radiation therapy	None	4	26	1.0	-
	1	5	6	9.43	1.02 - 87.4
	>1	0	3	0	-
Child's total number of diagnostic x-rays or radiation therapy, excluding those received within 1 year of diagnosis	None	6	27	1.0	-
	1	3	6	2.24	0.39 - 13.0
	>1	0	2	0	-
Child had transfusion	No	8	35	1.0	-
	Yes	1	1	4.00	0.25 - 64.0

**Table 9c. Interview Study Analysis of Health, Medical Conditions and Medical Procedures:  
Nervous System Cancers**

<b>Exposure Factor</b>	<b>Exposure Level</b>	<b>Number of Cases</b>	<b>Number of Controls</b>	<b>Odds Ratio</b>	<b>95% Confidence Interval</b>
<b>Prenatal Exposure: Nervous System Cancer Diagnosis Ages 0 through 19</b>					
Mother had fever > 100 ° for 3 or more days during pregnancy	No	16	68	1.0	-
	Yes	1	2	1.81	0.16 - 20.1
Mother had vaginal or uterine bleeding during pregnancy	No	15	62	1.0	-
	Yes	2	7	1.11	0.22 - 5.62
Mother had high blood pressure during pregnancy	No	16	67	1.0	-
	Yes	1	3	1.24	0.13 - 11.9
Mother had toxemia or pre-eclampsia during pregnancy	No	16	64	1.0	-
	Yes	1	6	0.65	0.07 - 5.72
Mother had protein in urine during pregnancy	No	16	66	1.0	-
	Yes	1	2	1.65	0.15 - 18.2
Mother had nausea or vomiting > 3 months during pregnancy	No	16	66	1.0	-
	Yes	1	4	0.87	0.08 - 9.22
Mother had other illnesses or complications during pregnancy	No	10	57	1.0	-
	Yes	7	14	2.62	0.83 - 8.31
Mother had antibiotics for 5+ days during pregnancy	No	12	58	1.0	-
	Yes	4	12	1.33	0.37 - 4.72
Mother had any vaccinations during pregnancy	No	16	67	1.0	-
	Yes	1	2	1.81	0.16 - 20.1
Mother had dental x-rays during pregnancy	No	11	42	1.0	-
	Yes	6	21	1.08	0.35 - 3.34

<b>Exposure Factor</b>	<b>Exposure Level</b>	<b>Number of Cases</b>	<b>Number of Controls</b>	<b>Odds Ratio</b>	<b>95% Confidence Interval</b>
Mother had diagnostic x-rays or radiation therapy during pregnancy	No	16	67	1.0	-
	Yes	1	3	1.81	0.16 - 20.1
<b>Postnatal Exposure: Nervous System Cancer Diagnosis Ages 0 through 19</b>					
Oxygen given to child immediately after birth	No	15	68	1.0	-
	Yes	2	3	2.51	0.42 - 15.1
Child had IV tube immediately after birth	No	16	67	1.0	-
	Yes	1	3	1.33	0.14 - 12.8
Child had phototherapy immediately after birth	No	13	51	1.0	-
	Yes	4	19	0.76	0.23 - 2.54
Child had problems after birth, prior to leaving hospital	No	15	63	1.0	-
	Yes	2	8	1.12	0.21 - 5.97
Child was breast fed	No	8	42	1.0	-
	Yes	9	28	2.03	0.64 - 6.48
Mother took multivitamins for 5+ days while breast feeding	No	1	5	1.0	-
	Yes	8	23	1.50	0.16 - 14.4
Child had mononucleosis	No	17	70	1.0	-
	Yes	0	1	0	-
Child had chickenpox	No	9	36	1.0	-
	Yes	8	34	0.74	0.17 - 3.09
Child had rubella	No	15	65	1.0	-
	Yes	2	5	2.46	0.16 - 36.8
Child had measles	No	14	58	1.0	-
	Yes	3	12	0.97	0.19 - 4.90

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<b>Exposure Factor</b>	<b>Exposure Level</b>	<b>Number of Cases</b>	<b>Number of Controls</b>	<b>Odds Ratio</b>	<b>95% Confidence Interval</b>
Child had mumps	No	16	65	1.0	-
	Yes	1	6	0.63	0.07 - 5.89
Child had epilepsy, seizures or convulsions	No	15	67	1.0	-
	Yes	2	4	2.45	0.33 - 18.5
Child had autoimmune disorder	No	17	70	1.0	-
	Yes	0	1	0	-
Child had immunosuppression or recurring infections	No	15	61	1.0	-
	Yes	2	10	0.73	0.12 - 4.39
Child had severe head injury	No	15	68	1.0	-
	Yes	2	3	2.67	0.45 - 16.0
Child had other major illnesses	No	12	54	1.0	-
	Yes	5	17	1.38	0.40 - 4.71
Child took antibiotics for 10 days or more	No	13	64	1.0	-
	Yes	3	6	3.00	0.67 - 13.4
Child had DPT or DT immunization	No	1	5	1.0	-
	Yes	16	66	1.35	0.15 - 12.4
Child had mumps immunization	No	3	10	1.0	-
	Yes	13	54	1.46	0.15 - 14.4
Child had rubella immunization	No	3	7	1.0	-
	Yes	14	60	0.46	0.04 - 5.36
Child had chickenpox immunization	No	15	59	1.0	-
	Yes	2	11	0.76	0.14 - 4.06
Child had measles immunization	No	5	11	1.0	-
	Yes	12	56	0.54	0.13 - 2.34

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<b>Exposure Factor</b>	<b>Exposure Level</b>	<b>Number of Cases</b>	<b>Number of Controls</b>	<b>Odds Ratio</b>	<b>95% Confidence Interval</b>
Child had polio immunization	No	1	7	1.0	-
	Yes	16	62	3.04	0.27 - 34.3
Child had dental x-rays	No	9	37	1.0	-
	Yes	8	34	0.59	0.06 - 5.41
Child had diagnostic x-rays or radiation therapy	No	12	56	1.0	-
	Yes	5	15	1.51	0.48 - 4.70
Child had diagnostic x-rays or radiation therapy, excluding those received within 1 year of diagnosis	No	16	60	1.0	-
	Yes	1	11	0.34	0.04 - 3.02
Child's total number of diagnostic x-rays or radiation therapy	None	12	56	1.0	-
	1	3	13	1.13	0.30 - 4.25
	>1	2	2	4.12	0.56 - 30.3
Child's total number of diagnostic x-rays or radiation therapy, excluding those received within 1 year of diagnosis	None	16	60	1.0	-
	1	1	9	0.43	0.05 - 3.61
	>1	0	2	0	-
Child had transfusion	No	17	70	1.0	-
	Yes	0	1	0	-
<b>Prenatal Exposure: Nervous System Cancer Diagnosis Ages 0 through 4</b>					
Mother had fever >100 ° for 3 or more days during pregnancy	No	7	33	1.0	-
	Yes	1	2	1.81	0.16 - 20.1
Mother had vaginal or uterine bleeding during pregnancy	No	6	29	1.0	-
	Yes	2	5	1.59	0.28 - 8.93
Mother had high blood pressure during pregnancy	No	7	32	1.0	-
	Yes	1	3	1.24	0.13 - 11.9

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<b>Exposure Factor</b>	<b>Exposure Level</b>	<b>Number of Cases</b>	<b>Number of Controls</b>	<b>Odds Ratio</b>	<b>95% Confidence Interval</b>
Mother had toxemia or pre-eclampsia during pregnancy	No	7	32	1.0	-
	Yes	1	3	1.40	0.12 - 16.4
Mother had protein in urine during pregnancy	No	7	34	1.0	-
	Yes	1	1	3.46	0.22 - 55.8
Mother had nausea or vomiting >3 months during pregnancy	No	7	33	1.0	-
	Yes	1	2	2.00	0.11 - 37.8
Mother had other illnesses or complications during pregnancy	No	3	26	1.0	-
	Yes	5	9	3.45	0.75 - 15.9
Mother had antibiotics for 5+ days during pregnancy	No	5	28	1.0	-
	Yes	3	7	1.86	0.40 - 8.66
Mother had any vaccinations during pregnancy	No	7	34	1.0	-
	Yes	1	1	4.00	0.25 - 64.0
Mother had dental x-rays during pregnancy	No	5	17	1.0	-
	Yes	3	13	0.75	0.15 - 3.71
Mother had diagnostic x-rays or radiation therapy during pregnancy	No	8	33	1.0	-
	Yes	0	2	0	-
<b>Postnatal Exposure: Nervous System Cancer Diagnosis Ages 0 through 4</b>					
Oxygen given to child immediately after birth	No	6	33	1.0	-
	Yes	2	2	3.72	0.52 - 26.5
Child had IV tube immediately after birth	No	7	33	1.0	-
	Yes	1	2	2.00	0.18 - 22.1
Child had phototherapy immediately after birth	No	5	25	1.0	-
	Yes	3	10	1.20	0.26 - 5.44

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<b>Exposure Factor</b>	<b>Exposure Level</b>	<b>Number of Cases</b>	<b>Number of Controls</b>	<b>Odds Ratio</b>	<b>95% Confidence Interval</b>
Child had problems after birth, prior to leaving hospital	No	6	30	1.0	-
	Yes	2	5	2.05	0.33 - 12.7
Child was breast fed	No	2	18	1.0	-
	Yes	6	17	3.16	0.61 - 16.5
Mother took multivitamins for 5+ days while breast feeding	No	1	2	1.0	-
	Yes	5	15	0.50	0.03 - 7.99
Child had mononucleosis	No	8	35	1.0	-
	Yes	0	0	-	-
Child had chickenpox	No	7	30	1.0	-
	Yes	1	4	0.74	0.04 - 12.6
Child had rubella	No	8	35	1.0	-
	Yes	0	0	-	-
Child had measles	No	8	35	1.0	-
	Yes	0	0	-	-
Child had mumps	No	8	35	1.0	-
	Yes	0	0	-	-
Child had epilepsy, seizures or convulsions	No	7	34	1.0	-
	Yes	1	1	-	-
Child had autoimmune disorder	No	8	34	1.0	-
	Yes	0	1	0	-
Child had immunosuppression or recurring infections	No	7	34	1.0	-
	Yes	1	1	4.00	0.25 - 64.0
Child had severe head injury	No	7	35	1.0	-
	Yes	1	0	-	-

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<b>Exposure Factor</b>	<b>Exposure Level</b>	<b>Number of Cases</b>	<b>Number of Controls</b>	<b>Odds Ratio</b>	<b>95% Confidence Interval</b>
Child had other major illnesses	No	6	29	1.0	-
	Yes	2	6	2.03	0.25 - 16.4
Child took antibiotics for 10 days or more	No	6	32	1.0	-
	Yes	2	2	8.00	0.73 - 88.2
Child had DPT or DT immunization	No	1	4	1.0	-
	Yes	7	31	1.07	0.11 - 10.7
Child had mumps immunization	No	2	7	-	-
	Yes	6	22	-	-
Child had rubella immunization	No	2	6	1.0	-
	Yes	6	26	1.15	0.07 - 20.5
Child had chickenpox immunization	No	7	32	1.0	-
	Yes	1	2	4.00	0.25 - 64.0
Child had measles immunization	No	2	8	-	-
	Yes	6	23	-	-
Child had polio immunization	No	1	6	1.0	-
	Yes	7	27	2.68	0.22 - 33.1
Child had dental x-rays	No	8	34	1.0	-
	Yes	0	1	0	-
Child had diagnostic x-rays or radiation therapy	No	4	31	1.0	-
	Yes	4	4	6.64	1.19 - 36.9
Child had diagnostic x-rays or radiation therapy, excluding those received within 1 year of diagnosis	No	8	33	1.0	-
	Yes	0	2	0	-

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<b>Exposure Factor</b>	<b>Exposure Level</b>	<b>Number of Cases</b>	<b>Number of Controls</b>	<b>Odds Ratio</b>	<b>95% Confidence Interval</b>
Child's total number of diagnostic x-rays or radiation therapy	None	4	31	1.0	-
	1	2	4	3.72	0.52 - 26.5
	>1	2	0	-	-
Child's total number of diagnostic x-rays or radiation therapy, excluding those received within 1 year of diagnosis	None	8	33	1.0	-
	1	0	2	0	-
	>1	0	0	-	-
Child had transfusion	No	8	34	1.0	-
	Yes	0	1	0	-

**Table 9d. Interview Study Analysis of Health, Medical Conditions and Medical Procedures:  
Brain and Central Nervous System Cancers**

<b>Exposure Factor</b>	<b>Exposure Level</b>	<b>Number of Cases</b>	<b>Number of Controls</b>	<b>Odds Ratio</b>	<b>95% Confidence Interval</b>
<b>Prenatal Exposure: Brain and Central Nervous System Diagnosis Ages 0 through 19</b>					
Mother had fever > 100 ° for 3 or more days during pregnancy	No	12	50	1.0	-
	Yes	0	1	0	-
Mother had vaginal or uterine bleeding during pregnancy	No	12	47	1.0	-
	Yes	0	3	0	-
Mother had high blood pressure during pregnancy	No	12	51	1.0	-
	Yes	0	0	-	-
Mother had toxemia or pre-eclampsia during pregnancy	No	12	48	1.0	-
	Yes	0	3	0	-
Mother had protein in urine during pregnancy	No	12	48	1.0	-
	Yes	0	1	0	-
Mother had nausea or vomiting > 3 months during pregnancy	No	12	49	1.0	-
	Yes	0	2	0	-
Mother had other illnesses or complications during pregnancy	No	8	44	1.0	-
	Yes	4	8	2.55	0.60 - 10.9
Mother had antibiotics for 5+ days during pregnancy	No	8	44	1.0	-
	Yes	3	7	1.83	0.39 - 8.67
Mother had any vaccinations during pregnancy	No	11	48	1.0	-
	Yes	1	2	1.81	0.16 - 20.1
Mother had dental x-rays during pregnancy	No	8	33	1.0	-
	Yes	4	15	1.05	0.27 - 4.08

<b>Exposure Factor</b>	<b>Exposure Level</b>	<b>Number of Cases</b>	<b>Number of Controls</b>	<b>Odds Ratio</b>	<b>95% Confidence Interval</b>
Mother had diagnostic x-rays or radiation therapy during pregnancy	No	11	48	1.0	-
	Yes	1	3	1.81	0.16 - 20.1
<b>Postnatal Exposure: Brain and Central Nervous System Diagnosis Ages 0 through 19</b>					
Oxygen given to child immediately after birth	No	11	51	1.0	-
	Yes	1	1	4.00	0.25 - 64.0
Child had IV tube immediately after birth	No	11	50	1.0	-
	Yes	1	1	4.00	0.25 - 64.0
Child had phototherapy immediately after birth	No	9	40	1.0	-
	Yes	3	11	1.08	0.26 - 4.46
Child had problems after birth, prior to leaving hospital	No	11	46	1.0	-
	Yes	1	6	0.77	0.08 - 7.76
Child was breast fed	No	6	31	1.0	-
	Yes	6	20	2.10	0.47 - 9.30
Mother took multivitamins for 5+ days while breast feeding	No	0	5	-	-
	Yes	6	15	-	-
Child had mononucleosis	No	12	51	1.0	-
	Yes	0	1	0	-
Child had chickenpox	No	4	18	1.0	-
	Yes	8	33	0.81	0.18 - 3.65
Child had rubella	No	10	46	1.0	-
	Yes	2	5	2.46	0.16 - 36.8
Child had measles	No	9	39	1.0	-
	Yes	3	12	0.97	0.19 - 4.90

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<b>Exposure Factor</b>	<b>Exposure Level</b>	<b>Number of Cases</b>	<b>Number of Controls</b>	<b>Odds Ratio</b>	<b>95% Confidence Interval</b>
Child had mumps	No	11	46	1.0	-
	Yes	1	6	0.63	0.07 - 5.89
Child had epilepsy, seizures or convulsions	No	10	48	1.0	-
	Yes	2	4	2.45	0.33 - 18.5
Child had autoimmune disorder	No	12	51	1.0	-
	Yes	0	1	0	-
Child had immunosuppression or recurring infections	No	10	42	1.0	-
	Yes	2	10	0.73	0.12 - 4.39
Child had severe head injury	No	10	49	1.0	-
	Yes	2	3	2.67	0.45 - 16.0
Child had other major illnesses	No	8	38	1.0	-
	Yes	4	14	1.37	0.33 - 5.66
Child had antibiotics for 10 days or more	No	9	46	1.0	-
	Yes	2	6	2.00	0.37 - 10.9
Child had DPT or DT immunization	No	0	2	-	-
	Yes	12	50	-	-
Child had mumps immunization	No	1	5	1.0	-
	Yes	10	45	0.85	0.08 - 9.71
Child had rubella immunization	No	1	2	-	-
	Yes	11	49	-	-
Child had chickenpox immunization	No	11	40	1.0	-
	Yes	1	11	0.33	0.04 - 2.96
Child had measles immunization	No	3	5	1.0	-
	Yes	9	47	0.29	0.06 - 1.48

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<b>Exposure Factor</b>	<b>Exposure Level</b>	<b>Number of Cases</b>	<b>Number of Controls</b>	<b>Odds Ratio</b>	<b>95% Confidence Interval</b>
Child had polio immunization	No	0	1	-	-
	Yes	12	50	-	-
Child had dental x-rays	No	4	18	1.0	-
	Yes	8	34	0.59	0.06 - 5.41
Child had diagnostic x-rays or radiation therapy	No	10	40	1.0	-
	Yes	2	12	0.68	0.13 - 3.51
Child had diagnostic x-rays or radiation therapy, excluding those received within 1 year of diagnosis	No	11	42	1.0	-
	Yes	1	10	0.38	0.04 - 3.45
Child's total number of diagnostic x-rays or radiation therapy	None	10	40	1.0	-
	1	2	10	0.80	0.16 - 4.02
	>1	0	2	0	-
Child's total number of diagnostic x-rays or radiation therapy, excluding those received within 1 year of diagnosis	None	11	42	1.0	-
	1	1	8	0.48	0.06 - 4.20
	>1	0	2	0	-
Child had transfusion	No	12	52	1.0	-
	Yes	0	0	-	-
<b>Prenatal Exposure: Brain and Central Nervous System Cancer Diagnosis Ages 0 through 4</b>					
Mother had fever >100 ° for 3 or more days during pregnancy	No	3	15	1.0	-
	Yes	0	1	0	-
Mother had vaginal or uterine bleeding during pregnancy	No	3	14	1.0	-
	Yes	0	1	0	-
Mother had high blood pressure during pregnancy	No	3	16	1.0	-
	Yes	0	0	-	-

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<b>Exposure Factor</b>	<b>Exposure Level</b>	<b>Number of Cases</b>	<b>Number of Controls</b>	<b>Odds Ratio</b>	<b>95% Confidence Interval</b>
Mother had toxemia or pre-eclampsia during pregnancy	No	3	16	1.0	-
	Yes	0	0	-	-
Mother had protein in urine during pregnancy	No	3	16	1.0	-
	Yes	0	0	-	-
Mother had nausea or vomiting >3 months during pregnancy	No	3	16	1.0	-
	Yes	0	0	-	-
Mother had other illnesses or complications during pregnancy	No	1	13	1.0	-
	Yes	2	3	5.06	0.40 - 64.0
Mother had antibiotics for 5+ days during pregnancy	No	1	14	1.0	-
	Yes	2	2	6.00	0.52 - 69.5
Mother had any vaccinations during pregnancy	No	2	15	1.0	-
	Yes	1	1	4.00	0.25 - 64.0
Mother had dental x-rays during pregnancy	No	2	8	1.0	-
	Yes	1	7	0.42	0.03 - 5.44
Mother had diagnostic x-rays or radiation therapy during pregnancy	No	3	14	1.0	-
	Yes	0	2	0	-
<b>Postnatal Exposure: Brain and Central Nervous System Cancer Diagnosis Ages 0 through 4</b>					
Oxygen given to child immediately after birth	No	2	16	1.0	-
	Yes	1	0	-	-
Child had IV tube immediately after birth	No	2	16	1.0	-
	Yes	1	0	-	-
Child had phototherapy immediately after birth	No	1	14	1.0	-
	Yes	2	2	6.00	0.52 - 69.5

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<b>Exposure Factor</b>	<b>Exposure Level</b>	<b>Number of Cases</b>	<b>Number of Controls</b>	<b>Odds Ratio</b>	<b>95% Confidence Interval</b>
Child had problems after birth, prior to leaving hospital	No	2	13	1.0	-
	Yes	1	3	2.45	0.14 - 42.6
Child was breast fed	No	0	7	-	-
	Yes	3	9	-	-
Mother took multivitamins for 5+ days while breast feeding	No	0	2	-	-
	Yes	3	7	-	-
Child had mononucleosis	No	3	16	1.0	-
	Yes	0	0	-	-
Child had chickenpox	No	2	12	1.0	-
	Yes	1	3	1.15	0.04 - 32.1
Child had rubella	No	3	16	1.0	-
	Yes	0	0	-	-
Child had measles	No	3	16	1.0	-
	Yes	0	0	-	-
Child had mumps	No	3	16	1.0	-
	Yes	0	0	-	-
Child had epilepsy, seizures or convulsions	No	2	15	1.0	-
	Yes	1	1	-	-
Child had autoimmune disorder	No	3	15	1.0	-
	Yes	0	1	0	-
Child had immunosuppression or recurring infections	No	2	15	1.0	-
	Yes	1	1	4.00	0.25 - 64.0
Child had severe head injury	No	2	16	1.0	-
	Yes	1	0	-	-

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<b>Exposure Factor</b>	<b>Exposure Level</b>	<b>Number of Cases</b>	<b>Number of Controls</b>	<b>Odds Ratio</b>	<b>95% Confidence Interval</b>
Child had other major illnesses	No	2	13	1.0	-
	Yes	1	3	0	-
Child took antibiotics for 10 days or more	No	2	14	1.0	-
	Yes	1	2	4.00	0.25 - 64.0
Child had DPT or DT immunization	No	0	1	-	-
	Yes	3	15	-	-
Child had mumps immunization	No	0	2	-	-
	Yes	3	13	-	-
Child had rubella immunization	No	0	1	-	-
	Yes	3	15	-	-
Subject had chickenpox immunization	No	3	13	1.0	-
	Yes	0	2	0	-
Child had measles immunization	No	0	2	-	-
	Yes	3	14	-	-
Child had polio immunization	No	0	0	-	-
	Yes	3	15	-	-
Child had dental x-rays	No	3	15	1.0	-
	Yes	0	1	0	-
Child had diagnostic x-rays or radiation therapy	No	2	15	1.0	-
	Yes	1	1	0	-
Child had diagnostic x-rays or radiation therapy, excluding those received within 1 year of diagnosis	No	3	15	1.0	-
	Yes	0	1	0	-

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<b>Exposure Factor</b>	<b>Exposure Level</b>	<b>Number of Cases</b>	<b>Number of Controls</b>	<b>Odds Ratio</b>	<b>95% Confidence Interval</b>
Child's total number of diagnostic x-rays or radiation therapy	None	2	15	1.0	-
	1	1	1	-	-
	>1	0	0	-	-
Child's total number of diagnostic x-rays or radiation therapy, excluding those received within 1 year of diagnosis	None	3	15	1.0	-
	1	0	1	0	-
	>1	0	0	-	-
Child had transfusion	No	3	16	1.0	-
	Yes	0	0	-	-

**Table 10. Interview Study Dietary Factors**

Characteristic	Cases (n = 40)		Controls (n =159)	
	Number	Percent	Number	Percent
Prenatal Exposure				
<b>Mother ate any fresh fruit or vegetables during pregnancy:</b>				
Yes	37	92.5	154	96.9
No	1	2.5	1	0.6
Unknown	2	5.0	4	2.5
<b>Mother ate daily servings of fresh fruit or vegetables during pregnancy:</b>				
Yes	29	72.5	118	74.2
No	9	22.5	37	23.3
Unknown	2	5.0	4	2.5
<b>Mother ate any hot dogs during pregnancy:</b>				
Yes	27	67.5	126	79.3
No	11	27.5	29	18.2
Unknown	2	5.0	4	2.5
<b>Mother's ate hot dogs weekly during pregnancy:</b>				
Yes	3	7.5	33	20.8
No	34	85.0	122	76.7
Unknown	3	7.5	4	2.5
<b>Mother ate any bacon, ham, or sausage during pregnancy:</b>				
Yes	33	82.5	138	86.8
No	5	12.5	18	11.3
Unknown	2	5.0	3	1.9
<b>Mother ate bacon, ham, or sausage weekly during pregnancy:</b>				
Yes	5	12.5	63	39.6
No	33	82.5	93	58.5
Unknown	2	5.0	3	1.9

Characteristic	Cases (n = 40)		Controls (n = 159)	
	Number	Percent	Number	Percent
<b>Mother ate any lunch meat during pregnancy:</b>				
Yes	32	80.0	137	86.2
No	5	12.5	19	12.0
Unknown	3	7.5	3	1.9
<b>Mother ate lunch meat weekly during pregnancy:</b>				
Yes	18	45.0	102	64.2
No	19	47.5	54	33.9
Unknown	3	7.5	3	1.9
<b>Mother ate any cured meat during pregnancy:</b>				
Yes	36	90.0	150	94.3
No	2	5.0	6	3.8
Unknown	2	5.0	3	1.9
<b>Mother ate cured meat weekly during pregnancy:</b>				
Yes	22	55.0	121	76.1
No	16	40.0	35	22.0
Unknown	2	5.0	3	1.9
<b>Mother took multivitamin supplementation for 5 days or more during pregnancy:</b>				
Yes	25	62.5	128	80.5
No	13	32.5	28	17.6
Unknown	2	5.0	3	1.9
<b>Mother drank tap water or drinks made from tap water at home during pregnancy:</b>				
Yes	37	92.5	148	93.1
No	1	2.5	7	4.4
Unknown	2	5.0	4	2.5
<b><u>For mothers who drank tap water during pregnancy:</u></b>				
Average number of glasses per day	5.4		5.0	

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Characteristic	Cases (n = 40)		Controls (n = 159)	
	Number	Percent	Number	Percent
<b>Postnatal Exposure</b>				
<b>Child ate bacon, ham or sausage:</b>				
Yes	28	70.0	115	72.3
No	11	27.5	44	27.7
Unknown	1	2.5	0	0
<b><u>Among those who ate bacon, ham or sausage:</u></b>				
Average annual frequency of consumption	56.7		50.4	
<b>Child ate hot dogs:</b>				
Yes	34	85.0	130	81.8
No	5	12.5	29	18.2
Unknown	1	2.5	0	0
<b><u>Among those who ate hot dogs:</u></b>				
Average annual frequency of consumption	53.6		48.5	
<b>Child ate lunch meats:</b>				
Yes	23	57.5	94	59.1
No	16	40.0	65	40.9
Unknown	1	2.5	0	0
<b><u>Among those who ate lunch meats:</u></b>				
Average annual frequency of consumption	74.4		108.1	
<b>Child ate fresh fruits or vegetables:</b>				
Yes	36	90.0	149	93.7
No	3	7.5	10	6.3
Unknown	1	2.5	0	0
<b><u>Among those who ate fresh fruits or vegetables:</u></b>				
Average annual frequency of consumption	330.1		306.9	

Characteristic	Cases (n = 40)		Controls (n = 159)	
	Number	Percent	Number	Percent
<b>Child consumed tap water or drinks made with tap water:</b>				
Yes	38	95.0	141	88.7
No	1	2.5	18	11.3
Unknown	1	2.5	0	0
<b><u>Among those who consumed tap water or drinks made with tap water:</u></b>				
Average number of glasses per day	4.4		4.1	

**Table 11a. Interview Study Analysis of Dietary Factors: Leukemia and Nervous System Cancers**

Exposure Factor	Exposure Level	Number of Cases	Number of Controls	Odds Ratio	95% Confidence Interval
<b>Prenatal Exposure: Leukemia and Nervous System Cancer Diagnosis Ages 0 through 19</b>					
Mother ate any fresh fruit or vegetables during pregnancy	No	1	1	1.0	-
	Yes	37	154	0.25	0.02 - 4.00
Mother ate daily servings of fresh fruit or vegetables during pregnancy	No	9	37	1.0	-
	Yes	29	118	0.96	0.42 - 2.18
Mother ate any hot dogs during pregnancy	No	11	29	1.0	-
	Yes	27	126	0.54	0.23 - 1.26
Mother ate hot dogs weekly during pregnancy	No	34	122	1.0	-
	Yes	3	33	0.33	0.10 - 1.12
Mother ate any bacon, ham, or sausage during pregnancy	No	5	18	1.0	-
	Yes	33	138	0.78	0.26 - 2.34
Mother ate bacon, ham, or sausage weekly during pregnancy	No	33	93	1.0	-
	Yes	5	63	0.21	0.08 - 0.57
Mother ate any lunch meat during pregnancy	No	5	19	1.0	-
	Yes	32	137	0.77	0.25 - 2.31
Mother ate lunch meat weekly during pregnancy	No	19	54	1.0	-
	Yes	18	102	0.44	0.22 - 0.91
Mother ate any cured meat during pregnancy	No	2	6	1.0	-
	Yes	36	150	0.46	0.07 - 2.85
Mother ate cured meat weekly during pregnancy	No	16	35	1.0	-
	Yes	22	121	0.34	0.16 - 0.74



Exposure Factor	Exposure Level	Number of Cases	Number of Controls	Odds Ratio	95% Confidence Interval
Mother took multivitamin supplements for 5+ days during pregnancy	No	13	28	1.0	-
	Yes	25	128	0.38	0.16 - 0.89
Mother drank tap water or made drinks from tap water during pregnancy	No	1	7	1.0	-
	Yes	37	148	1.54	0.17 - 13.6
Mother's average daily glasses of tap water or drinks made from tap water	None/Low	15	80	1.0	-
	High (>4/da)	23	75	1.58	0.78 - 3.20
Mother's average daily glasses of tap water or drinks made from tap water	None/Low	11	55	1.0	-
	Med. (4-5/da)	11	49	1.08	0.42 - 2.75
	High (6+/da)	16	51	1.52	0.66 - 3.50
<b>Postnatal Exposure: Leukemia and Nervous System Cancer Diagnosis Ages 0 through 19</b>					
Child ate fresh fruit or vegetables	No	3	10	1.0	-
	Yes	36	149	0.72	0.07 - 6.82
Child's average daily servings of fresh fruit or vegetables	None/Low	14	64	1.0	-
	High (1+/da)	25	95	1.25	0.59 - 2.67
Child ate hot dogs	No	5	29	1.0	-
	Yes	34	130	2.23	0.47 - 10.6
Child's average weekly servings of hot dogs	None	5	29	1.0	-
	Low	19	63	2.69	0.54 - 13.4
	High (1+/wk)	15	67	1.90	0.38 - 9.45
Child ate bacon, ham, or sausage	No	11	44	1.0	-
	Yes	28	115	0.83	0.28 - 2.47

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<b>Exposure Factor</b>	<b>Exposure Level</b>	<b>Number of Cases</b>	<b>Number of Controls</b>	<b>Odds Ratio</b>	<b>95% Confidence Interval</b>
Child's average weekly servings of bacon, ham, or sausage	None	11	44	1.0	-
	Low	14	46	1.00	0.32 - 3.16
	High (1 + /wk)	14	69	0.65	0.20 - 2.16
Child ate lunch meat	No	16	65	1.0	-
	Yes	23	94	0.92	0.37 - 2.28
Child's average weekly servings of lunch meat	None	11	65	1.0	-
	Low	8	15	1.93	0.61 - 6.13
	High (1 + /wk)	15	79	0.72	0.28 - 1.87
Child ate cured meat	No	4	22	1.0	-
	Yes	35	137	2.49	0.29 - 21.3
Child's average weekly servings of cured meat	None/Low	20	73	1.0	-
	High (2 + /wk)	19	86	0.73	0.34 - 1.58
Child drank tap water or made drinks from tap water	No	1	18	1.0	-
	Yes	38	141	6.46	0.72 - 58.0
Child's average daily glasses of tap water or made drinks from tap water	None/Low	8	55	1.0	-
	Med. (3-4/da)	14	53	1.88	0.71 - 4.94
	High (5 + /da)	17	51	2.31	0.90 - 5.92
Child's average daily glasses of tap water or made drinks from tap water	None/Low	14	80	1.0	-
	High (4 + /da)	25	79	1.78	0.85 - 3.72
<b>Prenatal Exposure: Leukemia and Nervous System Cancer Diagnosis Ages 0 through 4</b>					
Mother ate any fresh fruit or vegetables during pregnancy	No	1	0	-	-
	Yes	16	70	-	-

Table 11: page 3 of 24

<b>Exposure Factor</b>	<b>Exposure Level</b>	<b>Number of Cases</b>	<b>Number of Controls</b>	<b>Odds Ratio</b>	<b>95% Confidence Interval</b>
Mother ate daily servings of fresh fruit or vegetables during pregnancy	No	5	19	1.0	-
	Yes	12	51	0.93	0.29 - 2.96
Mother ate any hot dogs during pregnancy	No	5	15	1.0	-
	Yes	12	55	0.61	0.19 - 1.98
Mother ate hot dogs weekly during pregnancy	No	15	56	1.0	-
	Yes	2	14	0.55	0.12 - 2.52
Mother ate any bacon, ham, or sausage during pregnancy	No	2	11	1.0	-
	Yes	15	59	1.14	0.23 - 5.64
Mother ate bacon, ham, or sausage weekly during pregnancy	No	14	51	1.0	-
	Yes	3	19	0.53	0.14 - 2.08
Mother ate any lunch meat during pregnancy	No	2	11	1.0	-
	Yes	14	59	1.15	0.22 - 6.16
Mother ate lunch meat weekly during pregnancy	No	9	21	1.0	-
	Yes	7	49	0.30	0.10 - 0.93
Mother ate any cured meat during pregnancy	No	1	4	1.0	-
	Yes	16	66	0.41	0.02 - 7.10
Mother ate cured meat weekly during pregnancy	No	8	15	1.0	-
	Yes	9	55	0.24	0.07 - 0.85
Mother took multivitamin supplements for 5+ days during pregnancy	No	7	12	1.0	-
	Yes	10	58	0.20	0.05 - 0.86
Mother drank tap water or made drinks from tap water during pregnancy	No	1	5	1.0	-
	Yes	16	65	1.00	0.11 - 8.95

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Exposure Factor	Exposure Level	Number of Cases	Number of Controls	Odds Ratio	95% Confidence Interval
Mother's average daily glasses of tap water or drinks made from tap water	None/Low	7	39	1.0	-
	High (>4/da)	10	31	1.74	0.60 - 5.06
Mother's average daily glasses of tap water or drinks made from tap water	None/Low	6	28	1.0	-
	Med. (4-5/da)	4	17	1.08	0.26 - 4.59
	High (6+/da)	7	25	1.20	0.37 - 3.88
<b>Postnatal Exposure: Leukemia and Nervous System Cancer Diagnosis Ages 0 through 4</b>					
Child ate fresh fruit or vegetables	No	3	9	1.0	-
	Yes	14	62	0.45	0.03 - 6.77
Child's average daily servings of fresh fruit or vegetable	None/Low	5	31	1.0	-
	High (1+/da)	12	40	2.36	0.61 - 9.06
Child ate hot dogs	No	4	25	1.0	-
	Yes	13	46	3.70	0.43 - 31.8
Child's average weekly servings of hot dogs	None	4	25	1.0	-
	Low	4	22	2.49	0.24 - 25.8
	High (1+/wk)	9	24	4.55	0.51 - 40.4
Child ate bacon, ham, or sausage	No	11	37	1.0	-
	Yes	6	34	0.40	0.10 - 1.54
Child's average weekly servings of bacon, ham, or sausage	None	11	37	1.0	-
	Low	2	19	0.26	0.05 - 1.45
	High (1+/wk)	4	15	0.61	0.12 - 3.02
Child ate lunch meat	No	11	50	1.0	-
	Yes	6	21	1.34	0.34 - 5.22

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<b>Exposure Factor</b>	<b>Exposure Level</b>	<b>Number of Cases</b>	<b>Number of Controls</b>	<b>Odds Ratio</b>	<b>95% Confidence Interval</b>
Child's average weekly servings of lunch meat	None	11	50	1.0	-
	Low	2	5	1.75	0.28 - 10.8
	High (1 + /wk)	4	16	1.19	0.27 - 5.26
Child ate cured meat	No	4	22	1.0	-
	Yes	13	49	2.49	0.29 - 21.3
Child's average weekly servings of cured meat	None/Low	11	50	1.0	-
	High (2 + /wk)	6	21	1.26	0.38 - 4.22
Child drank tap water or made drinks from tap water	No	1	13	1.0	
	Yes	16	58	4.88	0.48 - 49.3
Child's average daily glasses of tap water or made drinks from tap water	None/Low	4	32	1.0	-
	Med. (3-4/da)	6	19	2.83	0.67 - 12.0
	High (5 + /da)	7	20	2.82	0.71 - 11.3
Child's average daily glasses of tap water or made drinks from tap water	None/Low	7	42	1.0	-
	High (4 + /da)	10	29	1.94	0.66 - 5.68

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**Table 11b. Interview Study Analysis of Dietary Factors: Leukemia**

Exposure Factor	Exposure Level	Number of Cases	Number of Controls	Odds Ratio	95% Confidence Interval
<b>Prenatal Exposure: Leukemia Diagnosis Ages 0 through 19</b>					
Mother ate any fresh fruit or vegetables during pregnancy	No	1	0	-	-
	Yes	20	85	-	-
Mother ate daily servings of fresh fruit or vegetables during pregnancy	No	6	24	1.0	-
	Yes	15	61	0.88	0.31 - 2.47
Mother ate any hot dogs during pregnancy	No	8	13	1.0	-
	Yes	13	72	0.30	0.10 - 0.90
Mother ate hot dogs weekly during pregnancy	No	20	72	1.0	-
	Yes	0	13	0	-
Mother ate any bacon, ham, or sausage during pregnancy	No	5	8	1.0	-
	Yes	16	78	0.27	0.06 - 1.18
Mother ate bacon, ham, or sausage weekly during pregnancy	No	18	54	1.0	-
	Yes	3	32	0.27	0.07 - 1.02
Mother ate any lunch meat during pregnancy	No	5	10	1.0	-
	Yes	16	76	0.34	0.09 - 1.32
Mother ate lunch meat weekly during pregnancy	No	11	34	1.0	-
	Yes	10	52	0.51	0.19 - 1.34
Mother ate any cured meat during pregnancy	No	2	2	1.0	-
	Yes	19	84	0.17	0.01 - 1.93
Mother ate cured meat weekly during pregnancy	No	9	23	1.0	-
	Yes	12	63	0.41	0.15 - 1.13

Exposure Factor	Exposure Level	Number of Cases	Number of Controls	Odds Ratio	95% Confidence Interval
Mother took multivitamin supplements for 5+ days during pregnancy	No	9	15	1.0	-
	Yes	12	71	0.23	0.07 - 0.73
Mother drank tap water or made drinks from tap water during pregnancy	No	1	1	1.0	-
	Yes	20	84	0.25	0.02 - 4.00
Mother's average daily glasses of tap water or drinks made from tap water	None/Low	6	49	1.0	-
	High (>4/da)	15	36	3.43	1.18 - 10.0
Mother's average daily glasses of tap water or drinks made from tap water	None/Low	3	30	1.0	-
	Med. (4-5/da)	9	31	3.07	0.72 - 13.0
	High (6+/da)	9	24	3.80	0.93 - 15.6
<b>Postnatal Exposure: Leukemia Diagnosis Ages 0 through 19</b>					
Child ate fresh fruit or vegetables	No	0	0	-	-
	Yes	22	88	-	-
Child's average daily servings of fresh fruit or vegetables	None/Low	6	32	1.0	-
	High (1+/da)	16	56	1.53	0.54 - 4.30
Child ate hot dogs	No	2	9	1.0	-
	Yes	20	79	1.15	0.21 - 6.21
Child's average weekly servings of hot dogs	None	2	9	1.0	-
	Low	13	38	1.63	0.28 - 9.29
	High (1+/wk)	7	41	0.79	0.13 - 4.73
Child ate bacon, ham, or sausage	No	5	15	1.0	-
	Yes	17	73	0.65	0.18 - 2.31

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<b>Exposure Factor</b>	<b>Exposure Level</b>	<b>Number of Cases</b>	<b>Number of Controls</b>	<b>Odds Ratio</b>	<b>95% Confidence Interval</b>
Child's average weekly servings of bacon, ham, or sausage	None	5	15	1.0	-
	Low	5	35	0.43	0.10 - 1.87
	High (1 + /wk)	12	38	0.89	0.24 - 4.08
Child ate lunch meat	No	5	28	1.0	-
	Yes	17	60	1.67	0.52 - 5.31
Child's average weekly servings of lunch meat	None	4	28	1.0	-
	Low	4	12	1.93	0.43 - 8.55
	High (1 + /wk)	13	48	1.60	0.48 - 5.28
Child ate cured meat	No	1	4	1.0	-
	Yes	21	84	1.00	0.10 - 10.1
Child's average weekly servings of cured meat	None/Low	8	38	1.0	-
	High (2 + /wk)	14	50	1.39	0.49 - 3.95
Child drank tap water or made drinks from tap water	No	0	8	-	-
	Yes	22	80	-	-
Child's average daily glasses of tap water or made drinks from tap water	None/Low	4	31	1.0	-
	Med. (3-4/da)	7	29	1.79	0.49 - 6.63
	High (5 + /da)	11	28	3.06	0.86 - 10.8
Child's average daily glasses of tap water or made drinks from tap water	None/Low	8	42	1.0	-
	High (4 + /da)	14	46	1.60	0.61 - 4.18
<b>Prenatal Exposure: Leukemia Diagnosis Ages 0 through 4</b>					
Mother ate any fresh fruit or vegetables during pregnancy	No	1	0	-	-
	Yes	8	35	-	-

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<b>Exposure Factor</b>	<b>Exposure Level</b>	<b>Number of Cases</b>	<b>Number of Controls</b>	<b>Odds Ratio</b>	<b>95% Confidence Interval</b>
Mother ate daily servings of fresh fruit or vegetables during pregnancy	No	5	10	1.0	-
	Yes	4	25	0.33	0.07 - 1.53
Mother ate any hot dogs during pregnancy	No	4	6	1.0	-
	Yes	5	29	0.29	0.06 - 1.36
Mother ate hot dogs weekly during pregnancy	No	9	28	1.0	-
	Yes	0	7	0	-
Mother ate any bacon, ham, or sausage during pregnancy	No	2	4	1.0	-
	Yes	7	31	0.41	0.05 - 3.07
Mother ate bacon, ham, or sausage weekly during pregnancy	No	7	26	1.0	-
	Yes	2	9	0.82	0.14 - 4.77
Mother ate any lunch meat during pregnancy	No	2	5	1.0	-
	Yes	7	30	0.53	0.07 - 3.89
Mother ate lunch meat weekly during pregnancy	No	5	11	1.0	-
	Yes	4	24	0.37	0.08 - 1.64
Mother ate any cured meat during pregnancy	No	1	1	-	-
	Yes	8	34	-	-
Mother ate cured meat weekly during pregnancy	No	4	8	1.0	-
	Yes	5	27	0.36	0.07 - 1.71
Mother took multivitamin supplements for 5+ days during pregnancy	No	5	4	1.0	-
	Yes	4	31	0.06	0.01 - 0.57
Mother drank tap water or made drinks from tap water during pregnancy	No	1	1	1.0	-
	Yes	8	34	0.25	0.02 - 4.00

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Exposure Factor	Exposure Level	Number of Cases	Number of Controls	Odds Ratio	95% Confidence Interval
Mother's average daily glasses of tap water or drinks made from tap water	None/Low	4	21	1.0	-
	High (>4/da)	5	14	1.88	0.41 - 8.55
Mother's average daily glasses of tap water or drinks made from tap water	None/Low	3	13	1.0	-
	Med. (4-5/da)	3	10	1.35	0.20 - 9.36
	High (6+/da)	3	12	1.07	0.19 - 5.98
<b>Postnatal Exposure: Leukemia Diagnosis Ages 0 through 4</b>					
Child ate fresh fruit or vegetables	No	0	0	-	-
	Yes	9	36	-	-
Child's average daily servings of fresh fruit or vegetables	None/Low	1	11	1.0	-
	High (1+/da)	8	25	3.23	0.38 - 27.3
Child ate hot dogs	No	1	6	1.0	-
	Yes	8	30	1.72	0.16 - 18.8
Child's average weekly servings of hot dog	None	1	6	1.0	-
	Low	4	13	1.97	0.16 - 24.2
	High (1+/wk)	4	17	1.52	0.12 - 18.7
Child ate bacon, ham, or sausage	No	5	11	1.0	-
	Yes	4	25	0.35	0.08 - 1.61
Child's average weekly servings of bacon, ham, or sausage	None	5	11	1.0	-
	Low	1	15	0.17	0.02 - 1.59
	High (1+/wk)	3	10	0.70	0.11 - 4.67
Child ate lunch meat	No	4	17	1.0	-
	Yes	5	19	1.13	0.25 - 5.16

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<b>Exposure Factor</b>	<b>Exposure Level</b>	<b>Number of Cases</b>	<b>Number of Controls</b>	<b>Odds Ratio</b>	<b>95% Confidence Interval</b>
Child's average weekly servings of lunch meat	None	4	17	1.0	-
	Low	1	5	0.89	0.09 - 9.17
	High (1 + /wk)	4	14	1.21	0.24 - 6.05
Child ate cured meat	No	1	4	1.0	-
	Yes	8	32	1.00	0.10 - 10.1
Child's average weekly servings of cured meat	None/Low	6	20	1.0	-
	High (2 + /wk)	3	16	0.60	0.12 - 2.96
Child drank tap water or made drinks from tap water	No	0	4	-	-
	Yes	9	32	-	-
Child's average daily glasses of tap water or made drinks from tap water	None/Low	2	14	1.0	-
	Med. (3-4/da)	3	13	1.56	0.21 - 11.7
	High (5 + /da)	4	9	3.01	0.45 - 19.9
Child's average daily glasses of tap water or made drinks from tap water	None/Low	4	18	1.0	-
	High (4 + /da)	5	18	1.23	0.30 - 5.14

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**Table 11c. Interview Study Analysis of Dietary Factors: Nervous System Cancers**

Exposure Factor	Exposure Level	Number of Cases	Number of Controls	Odds Ratio	95% Confidence Interval
<b>Prenatal Exposure: Nervous System Cancer Diagnosis Ages 0 through 19</b>					
Mother ate any fresh fruit or vegetables during pregnancy	No	0	1	-	-
	Yes	17	69	-	-
Mother ate daily servings of fresh fruit or vegetables during pregnancy	No	3	13	1.0	-
	Yes	14	57	1.10	0.28 - 4.37
Mother ate any hot dogs during pregnancy	No	3	16	1.0	-
	Yes	14	54	1.27	0.32 - 5.14
Mother ate hot dogs weekly during pregnancy	No	14	50	1.0	-
	Yes	3	20	0.54	0.14 - 1.99
Mother ate any bacon, ham, or sausage during pregnancy	No	0	10	-	-
	Yes	17	60	-	-
Mother ate bacon, ham, or sausage weekly during pregnancy	No	15	39	1.0	-
	Yes	2	31	0.15	0.03 - 0.72
Mother ate any lunch meat during pregnancy	No	0	9	-	-
	Yes	16	61	-	-
Mother ate lunch meat weekly during pregnancy	No	8	20	1.0	-
	Yes	8	50	0.38	0.13 - 1.10
Mother ate any cured meat during pregnancy	No	0	4	-	-
	Yes	17	66	-	-
Mother ate cured meat weekly during pregnancy	No	7	12	1.0	-
	Yes	10	58	0.27	0.08 - 0.88

<b>Exposure Factor</b>	<b>Exposure Level</b>	<b>Number of Cases</b>	<b>Number of Controls</b>	<b>Odds Ratio</b>	<b>95% Confidence Interval</b>
Mother took multivitamin supplements for 5+ days during pregnancy	No	4	13	1.0	-
	Yes	13	57	0.76	0.20 - 2.96
Mother drank tap water or made drinks from tap water during pregnancy	No	0	6	-	-
	Yes	17	64	-	-
Mother's average daily glasses of tap water or drinks made from tap water	None/Low	9	31	1.0	-
	High (>4/da)	8	39	0.72	0.26 - 1.97
Mother's average daily glasses of tap water or drinks made from tap water	None/Low	8	25	1.0	-
	Med. (4-5/da)	2	18	0.35	0.07 - 1.80
	High (6+/da)	7	27	0.82	0.28 - 2.46
<b>Postnatal Exposure: Nervous System Cancer Diagnosis Ages 0 through 19</b>					
Child ate fresh fruit or vegetables	No	3	10	1.0	-
	Yes	14	61	0.72	0.07 - 6.82
Child's average daily servings of fresh fruit or vegetables	None/Low	8	32	1.0	-
	High (1+/da)	9	39	0.98	0.32 - 3.01
Child ate hot dogs	No	3	20	-	-
	Yes	14	51	-	-
Child's average weekly servings of hot dogs	None	3	20	-	-
	Low	6	25	-	-
	High (1+/wk)	8	26	-	-
Child ate bacon, ham, or sausage	No	6	29	1.0	-
	Yes	11	42	1.59	0.19 - 13.3

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<b>Exposure Factor</b>	<b>Exposure Level</b>	<b>Number of Cases</b>	<b>Number of Controls</b>	<b>Odds Ratio</b>	<b>95% Confidence Interval</b>
Child's average weekly servings of bacon, ham, or sausage	None	6	29	1.0	-
	Low	9	11	6.25	0.35 - 122
	High (1 + /wk)	2	31	0.65	0.04 - 11.7
Child ate lunch meat	No	11	37	1.0	-
	Yes	6	34	0.20	0.03 - 1.22
Child's average weekly servings of lunch meat	None	11	37	1.0	-
	Low	4	3	2.85	0.21 - 38.1
	High (1 + /wk)	2	31	0.08	0.01 - 0.76
Child ate cured meat	No	3	18	-	-
	Yes	14	53	-	-
Child's average weekly servings of cured meat	None/Low	12	35	1.0	-
	High (2 + /wk)	5	36	0.30	0.09 - 1.01
Child drank tap water or made drinks from tap water	No	1	10	1.0	-
	Yes	16	61	3.69	0.31 - 43.3
Child's average daily glasses of tap water or made drinks from tap water	None/Low	4	24	1.0	-
	Med. (3-4/da)	7	24	2.05	0.47 - 8.95
	High (5 + /da)	6	23	1.60	0.38 - 6.72
Child's average daily glasses of tap water or made drinks from tap water	None/Low	6	38	1.0	-
	High (4 + /da)	11	33	2.07	0.67 - 6.45
<b>Prenatal Exposure: Nervous System Cancer Diagnosis Ages 0 through 4</b>					
Mother ate any fresh fruit or vegetables during pregnancy	No	0	0	-	-
	Yes	8	35	-	-

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<b>Exposure Factor</b>	<b>Exposure Level</b>	<b>Number of Cases</b>	<b>Number of Controls</b>	<b>Odds Ratio</b>	<b>95% Confidence Interval</b>
Mother ate daily fresh fruit or vegetables during pregnancy	No	0	9	-	-
	Yes	8	26	-	-
Mother ate any hot dogs during pregnancy	No	1	9	1.0	-
	Yes	7	26	2.01	0.22 - 18.5
Mother ate hot dogs weekly during pregnancy	No	6	28	1.0	-
	Yes	2	7	1.16	0.22 - 6.23
Mother ate any bacon, ham, or sausage during pregnancy	No	0	7	-	-
	Yes	8	28	-	-
Mother ate bacon, ham, or sausage weekly during pregnancy	No	7	25	1.0	-
	Yes	1	10	0.31	0.03 - 2.83
Mother ate any lunch meat during pregnancy	No	0	6	-	-
	Yes	7	29	-	-
Mother ate lunch meat weekly during pregnancy	No	4	10	1.0	-
	Yes	3	25	0.23	0.04 - 1.33
Mother ate any cured meat during pregnancy	No	0	3	-	-
	Yes	8	32	-	-
Mother ate cured meat weekly during pregnancy	No	4	7	1.0	-
	Yes	4	28	0.12	0.01 - 1.19
Mother took multivitamin supplements for 5+ days during pregnancy	No	2	8	1.0	-
	Yes	6	27	0.95	0.12 - 7.39
Mother drank tap water or made drinks from tap water during pregnancy	No	0	4	-	-
	Yes	8	31	-	-

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<b>Exposure Factor</b>	<b>Exposure Level</b>	<b>Number of Cases</b>	<b>Number of Controls</b>	<b>Odds Ratio</b>	<b>95% Confidence Interval</b>
Mother's average daily glasses of tap water or drinks made from tap water	None/Low	3	18	1.0	-
	High (>4/da)	5	17	1.62	0.36 - 7.24
Mother's average daily glasses of tap water or drinks made from tap water	None/Low	3	15	1.0	-
	Med. (4-5/da)	1	7	0.76	0.07 - 7.98
	High (6+/da)	4	13	1.34	0.27 - 6.66
<b>Postnatal Exposure: Nervous System Cancer Diagnosis Ages 0 through 4</b>					
Child ate fresh fruit or vegetables	No	3	9	1.0	-
	Yes	5	26	0.45	0.03 - 6.77
Child's average daily servings of fresh fruit or vegetables	None/Low	4	20	1.0	-
	High (1+/da)	4	15	1.82	0.30 - 11.1
Child ate hot dogs	No	3	19	-	-
	Yes	5	16	-	-
Child's average weekly servings of hot dogs	None	3	19	-	-
	Low	0	9	-	-
	High (1+/wk)	5	7	-	-
Child ate bacon, ham, or sausage	No	6	26	1.0	-
	Yes	2	9	0.65	0.03 - 12.4
Child's average weekly servings of bacon, ham, or sausage	None	6	26	1.0	-
	Low	1	4	0.71	0.02 - 24.7
	High (1+/wk)	1	5	0.62	0.03 - 14.8
Child ate lunch meat	No	7	33	1.0	-
	Yes	1	2	2.45	0.14 - 42.6

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<b>Exposure Factor</b>	<b>Exposure Level</b>	<b>Number of Cases</b>	<b>Number of Controls</b>	<b>Odds Ratio</b>	<b>95% Confidence Interval</b>
Child's average weekly servings of lunch meat	None	7	33	1.0	-
	Low	1	0	-	-
	High (1 + /wk)	0	2	0	-
Child ate cured meat	No	3	18	1.0	-
	Yes	5	17	0	-
Child's average weekly servings of cured meat	None/Low	5	30	1.0	-
	High (2 + /wk)	3	5	3.70	0.56 - 24.3
Child drank tap water or made drinks from tap water	No	1	9	1.0	-
	Yes	7	26	3.31	0.26 - 42.1
Child's average daily servings of tap water or made drinks from tap water	None/Low	2	18	1.0	-
	Med. (3-4/da)	3	6	5.52	0.72 - 42.6
	High (5 + /da)	3	11	2.23	0.27 - 18.2
Child's average daily glasses of tap water or made drinks from tap water	None/Low	3	24	1.0	-
	High (4 + /da)	5	11	3.26	0.68 - 15.5

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**Table 11d. Interview Study Analysis of Dietary Factors: Brain and Central Nervous System Cancers**

Exposure Factor	Exposure Level	Number of Cases	Number of Controls	Odds Ratio	95% Confidence Interval
<b>Prenatal Exposure: Brain and Central Nervous System Cancer Diagnosis Ages 0 through 19</b>					
Mother ate any fresh fruit or vegetables during pregnancy	No	0	1	-	-
	Yes	12	50	-	-
Mother ate daily servings of fresh fruit or vegetables during pregnancy	No	3	8	1.0	-
	Yes	9	43	0.55	0.12 - 2.59
Mother ate any hot dogs during pregnancy	No	2	11	1.0	-
	Yes	10	40	1.22	0.21 - 7.05
Mother ate hot dogs weekly during pregnancy	No	9	36	1.0	-
	Yes	3	15	0.75	0.19 - 3.01
Mother ate any bacon, ham, or sausage during pregnancy	No	0	7	-	-
	Yes	12	44	-	-
Mother ate bacon, ham, or sausage weekly during pregnancy	No	11	24	1.0	-
	Yes	1	27	0.08	0.01 - 0.65
Mother ate any lunch meat during pregnancy	No	0	6	-	-
	Yes	12	45	-	-
Mother ate lunch meat weekly during pregnancy	No	6	14	1.0	-
	Yes	6	37	0.37	0.10 - 1.28
Mother ate any cured meat during pregnancy	No	0	3	-	-
	Yes	12	48	-	-
Mother ate cured meat weekly during pregnancy	No	4	8	1.0	-
	Yes	8	43	0.33	0.08 - 1.35

<b>Exposure Factor</b>	<b>Exposure Level</b>	<b>Number of Cases</b>	<b>Number of Controls</b>	<b>Odds Ratio</b>	<b>95% Confidence Interval</b>
Mother took multivitamin supplements for 5+ days during pregnancy	No Yes	2 10	6 45	1.0 0.65	- 0.11 - 3.75
Mother drank tap water or made drinks from tap water during pregnancy	No Yes	0 12	4 47	- -	- -
Mother's average daily glasses of tap water or drinks made from tap water	None/Low High (>4/da)	7 5	22 29	1.0 0.58	- 0.17 - 1.92
Mother's average daily glasses of tap water or drinks made from tap water	None/Low Med. (4-5/da) High (6+/da)	6 2 4	16 15 20	1.0 0.37 0.57	- 0.07 - 1.99 0.15 - 2.19
<b>Postnatal Exposure: Brain and Central Nervous System Cancer Diagnosis Ages 0 through 19</b>					
Child ate fresh fruit or vegetables	No Yes	0 12	2 50	- -	- -
Child's average daily servings of fresh fruit or vegetables	None/Low High (1+/da)	5 7	18 34	1.0 0.78	- 0.22 - 2.72
Child ate hot dogs	No Yes	0 12	6 46	- -	- -
Child's average weekly servings of hot dogs	None Low High (1+/wk)	0 6 6	6 22 24	- - -	- - -
Child ate bacon, ham, or sausage	No Yes	2 10	14 38	1.0 2.11	- 0.13 - 33.5

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<b>Exposure Factor</b>	<b>Exposure Level</b>	<b>Number of Cases</b>	<b>Number of Controls</b>	<b>Odds Ratio</b>	<b>95% Confidence Interval</b>
Child's average weekly servings of bacon, ham, or sausage	None	2	14	1.0	-
	Low	9	8	13.3	0.20 - 885
	High (1 + /wk)	1	30	0.60	0.01 - 39.0
Child ate lunch meat	No	6	19	1.0	-
	Yes	6	33	0.21	0.03 - 1.31
Child's average weekly servings of lunch meat	None	6	19	1.0	-
	Low	4	3	2.87	0.21 - 38.4
	High (1 + /wk)	2	30	0.08	0.01 - 0.79
Child ate cured meat	No	0	5	-	-
	Yes	12	47	-	-
Child's average weekly servings of cured meat	None/Low	8	18	1.0	-
	High (2 + /wk)	4	34	0.22	0.06 - 0.79
Child drank tap water or made drinks from tap water	No	0	3	-	-
	Yes	12	49	-	-
Child's average daily glasses of tap water or made drinks from tap water	None/Low	3	13	1.0	-
	Med. (3-4/da)	5	23	0.95	0.18 - 4.94
	High (5 + /da)	4	16	1.06	0.21 - 5.40
Child's average daily glasses of tap water or made drinks from tap water	None/Low	5	26	1.0	-
	High (4 + /da)	7	26	1.31	0.35 - 4.91
<b>Prenatal Exposure: Brain and Central Nervous System Cancer Diagnosis Ages 0 through 4</b>					
Mother ate any fresh fruit or vegetables during pregnancy	No	0	0	-	-
	Yes	3	16	-	-

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<b>Exposure Factor</b>	<b>Exposure Level</b>	<b>Number of Cases</b>	<b>Number of Controls</b>	<b>Odds Ratio</b>	<b>95% Confidence Interval</b>
Mother ate daily servings of fresh fruit or vegetables during pregnancy	No	0	4	-	-
	Yes	3	12	-	-
Mother ate any hot dogs during pregnancy	No	0	4	-	-
	Yes	3	12	-	-
Mother ate hot dogs weekly during pregnancy	No	1	14	1.0	-
	Yes	2	2	6.00	0.52 - 69.5
Mother ate any bacon, ham, or sausage during pregnancy	No	0	4	-	-
	Yes	3	12	-	-
Mother ate bacon, ham, or sausage weekly during pregnancy	No	3	10	1.0	-
	Yes	0	6	0	-
Mother ate any lunch meat during pregnancy	No	0	3	-	-
	Yes	3	13	-	-
Mother ate lunch meat weekly during pregnancy	No	2	4	-	-
	Yes	1	12	-	-
Mother ate any cured meat during pregnancy	No	0	2	-	-
	Yes	3	14	-	-
Mother ate cured meat weekly during pregnancy	No	1	3	-	-
	Yes	2	13	-	-
Mother took multivitamin supplements for 5+ days during pregnancy	No	0	1	-	-
	Yes	3	15	-	-
Mother drank tap water or made drinks from tap water during pregnancy	No	0	2	-	-
	Yes	3	14	-	-

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<b>Exposure Factor</b>	<b>Exposure Level</b>	<b>Number of Cases</b>	<b>Number of Controls</b>	<b>Odds Ratio</b>	<b>95% Confidence Interval</b>
Mother's average daily glasses of tap water or drinks made from tap water	None/Low	1	9	1.0	-
	High (>4/da)	2	7	2.35	0.21 - 26.8
Mother's average daily glasses of tap water or drinks made from tap water	None/Low	1	6	1.0	-
	Med. (4-5/da)	1	4	1.27	0.07 - 22.3
	High (6+/da)	1	6	0.84	0.05 - 13.7
<b>Postnatal Exposure: Brain and Central Nervous System Cancer Diagnosis Ages 0 through 4</b>					
Child ate fresh fruit or vegetables	No	0	1	-	-
	Yes	3	15	-	-
Child's average daily servings of fresh fruit or vegetables	None/Low	1	6	1.0	-
	High (1+/da)	2	10	1.38	0.11 - 17.4
Child ate hot dogs	No	0	5	-	-
	Yes	3	11	-	-
Child's average weekly servings of hot dogs	None	0	5	-	-
	Low	0	6	-	-
	High(1+/wk)	3	5	-	-
Child ate bacon, ham, or sausage	No	2	11	-	-
	Yes	1	5	-	-
Child's average weekly servings of bacon, ham, or sausage	None	2	11	1.0	-
	Low	1	1	-	-
	High (1+/wk)	0	4	0	-
Child ate lunch meat	No	2	15	1.0	-
	Yes	1	1	-	-

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<b>Exposure Factor</b>	<b>Exposure Level</b>	<b>Number of Cases</b>	<b>Number of Controls</b>	<b>Odds Ratio</b>	<b>95% Confidence Interval</b>
Child's average weekly servings of lunch meat	None	2	15	1.0	-
	Low	1	0	-	-
	High (1 + /wk)	0	1	0	-
Child ate cured meat	No	0	5	-	-
	Yes	3	11	-	-
Child's average weekly servings of cured meat	None/Low	1	13	1.0	-
	High (2 + /wk)	2	3	5.06	0.40 - 64.0
Child drank tap water or made drinks from tap water	No	0	2	-	-
	Yes	3	14	-	-
Child's average daily glasses of tap water or made drinks from tap water	None/Low	1	7	1.0	-
	Med. (3-4/da)	1	7	1.79	0.11 - 30.3
	High (5 + /da)	1	4	1.79	0.11 - 30.3
Child's average daily glasses of tap water or made drinks from tap water	None/Low	2	12	1.0	-
	High (4 + /da)	1	4	1.40	0.12 - 16.4

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**Table 12. Interview Study Exposure to Tobacco Smoke and Alcohol**

Characteristic	Cases (n = 40)		Controls (n = 159)	
	Number	Percent	Number	Percent
<b>Prenatal Exposure</b>				
<b>Mother smoked during pregnancy:</b>				
Yes	12	30.0	46	28.9
No	27	67.5	111	69.8
Unknown	1	2.5	2	1.3
<b><u>Among mothers who smoked during pregnancy:</u></b>				
Average number of smoking months	7.8		8.2	
Average number of cigarettes per day	12.1		13.9	
Average total cigarettes	2800		3640	
<b>Any regular smoking by anyone else in household during pregnancy:</b>				
Yes	12	30.0	65	40.9
No	26	65.0	89	55.9
Unknown	2	5.0	5	3.1
<b><u>Anyone else who smoked in the household during pregnancy:</u></b>				
Average number of cigarettes per day	13.6		14.3	
Average total cigarettes	3747		3838	
<b>Mother consumed any alcohol during pregnancy:</b>				
Yes	8	20.0	50	31.5
No	30	75.0	106	66.7
Unknown	2	5.0	3	1.9



Characteristic	Cases (n = 40)		Controls (n = 159)	
	Number	Percent	Number	Percent
<b><u>Among mothers who consumed alcohol during pregnancy:</u></b>				
Mother drank wine	7		40	
Average servings of wine per month	1.8		1.4	
Mother drank beer	0		17	
Average servings of beer per month	0		1.8	
Mother drank mixed drinks	2		11	
Average servings of mixed drinks per month	0.7		1.0	
Average drinks per month	1.7		2.0	
Average number of drinks during pregnancy	16		18	
<b><u>Ever had 5 or more drinks at one sitting:</u></b>				
Yes	0	0.0	0	0.0
No	8	100.0	50	100.0
Unknown	0	0.0	0	0.0
<b>Postnatal Exposure</b>				
<b>Child's exposure to tobacco smoke in the home:</b>				
Yes	19	47.5	81	50.9
No	20	50.0	78	49.1
Unknown	1	2.5	0	0
<b><u>Among children with domestic smoke exposure:</u></b>				
Average daily number of cigarettes smoked in the home	16.0		18.8	

Table 12: page 2 of 2

**Table 13a. Interview Study Analysis of Exposure to Tobacco Smoke and Alcohol:  
Leukemia and Nervous System Cancers**

<b>Exposure Factor</b>	<b>Exposure Level</b>	<b>Number of Cases</b>	<b>Number of Controls</b>	<b>Odds Ratio</b>	<b>95% Confidence Interval</b>
<b>Prenatal Exposure: Leukemia and Nervous System Cancer Diagnosis Ages 0 through 19</b>					
Mother smoked during pregnancy	No	27	111	1.0	-
	Yes	12	46	1.04	0.48 - 2.24
Average daily number of cigarettes smoked by mother when smoking during pregnancy	None	27	111	1.0	-
	Low	7	22	1.26	0.50 - 3.15
	High (> ½pk/da)	5	22	0.93	0.31 - 2.81
Any regular smoking by anyone else in household during pregnancy	No	26	89	1.0	-
	Yes	12	65	0.58	0.27 - 1.26
Average daily number of cigarettes smoked in household by anyone else during pregnancy	None	26	89	1.0	-
	Low	7	34	0.64	0.25 - 1.64
	High (> ½pk/da)	5	31	0.51	0.18 - 1.46
Mother consumed any alcohol during pregnancy	No	30	106	1.0	-
	Yes	8	50	0.54	0.23 - 1.26
Mother consumed any wine during pregnancy	No	31	115	1.0	-
	Yes	7	40	0.62	0.25 - 1.51
Mother consumed any mixed drinks during pregnancy	No	36	144	1.0	-
	Yes	2	11	0.70	0.14 - 3.44
Number of alcoholic drinks the mother consumed during pregnancy	None	30	106	1.0	-
	Low	6	26	0.78	0.30 - 2.03
	High (>9)	2	23	0.28	0.06 - 1.27

Exposure Factor	Exposure Level	Number of Cases	Number of Controls	Odds Ratio	95% Confidence Interval
<b>Postnatal Exposure: Leukemia and Nervous System Cancer Diagnosis Ages 0 through 19</b>					
Child's exposure to tobacco smoke in the home	No	20	78	1.0	-
	Yes	19	81	0.85	0.41 - 1.76
Average daily number of cigarettes smoked in the child's home	None	20	78	1.0	-
	Low	11	45	0.89	0.39 - 2.02
	High (1 + pk/da)	8	36	0.80	0.31 - 2.06
<b>Prenatal Exposure: Leukemia and Nervous System Cancer Diagnosis Ages 0 through 4</b>					
Mother smoked during pregnancy	No	13	51	1.0	-
	Yes	4	19	0.77	0.22 - 2.62
Average daily number of cigarettes smoked by mother when smoking during pregnancy	None	13	51	1.0	-
	Low	3	11	0.97	0.25 - 3.82
	High (> ½pk/da)	1	8	0.46	0.05 - 3.95
Any regular smoking by anyone else in household during pregnancy	No	14	44	1.0	-
	Yes	3	25	0.32	0.08 - 1.27
Average number of cigarettes smoked in household by anyone else during pregnancy	None	14	44	1.0	-
	Low	2	14	0.40	0.08 - 1.94
	High (> ½pk/da)	1	11	0.24	0.03 - 2.03
Mother consumed any alcohol during pregnancy	No	13	52	1.0	-
	Yes	4	18	0.85	0.25 - 2.82
Mother consumed any wine during pregnancy	No	13	55	1.0	-
	Yes	4	15	1.07	0.30 - 3.78
Mother consumed any mixed drinks during pregnancy	No	16	69	1.0	-
	Yes	1	1	4.00	0.25 - 64.0

Table 13: page 2 of 12

<b>Exposure Factor</b>	<b>Exposure Level</b>	<b>Number of Cases</b>	<b>Number of Controls</b>	<b>Odds Ratio</b>	<b>95% Confidence Interval</b>
Number of alcoholic drinks the mother consumed during pregnancy	None	13	52	1.0	-
	Low	3	9	1.24	0.31 - 4.97
	High (>9)	1	9	0.43	0.05 - 3.63
<b>Postnatal Exposure: Leukemia and Nervous System Cancer Diagnosis Ages 0 through 4</b>					
Child's exposure to tobacco smoke in the home	No	12	41	1.0	-
	Yes	5	30	0.50	0.16 - 1.58
Average daily number of cigarettes smoked in the home	None	12	41	1.0	-
	Low	3	19	0.49	0.13 - 1.88
	High (1+ pk/da)	2	11	0.52	0.10 - 2.69

**Table 13b. Interview Study Analysis of Exposure to Tobacco Smoke and Alcohol: Leukemia**

Exposure Factor	Exposure Level	Number of Cases	Number of Controls	Odds Ratio	95% Confidence Interval
<b>Prenatal Exposure: Leukemia Diagnosis Ages 0 through 19</b>					
Mother smoked during pregnancy	No	14	63	1.0	-
	Yes	8	24	1.56	0.54 - 4.52
Average daily number of cigarettes smoked by mother during pregnancy	None	14	63	1.0	-
	Low	5	9	2.61	0.72 - 9.54
	High (> ½pk/da)	3	13	1.21	0.26 - 5.56
Any regular smoking by anyone else in household during pregnancy	No	14	56	1.0	-
	Yes	7	29	0.93	0.33 - 2.63
Average daily cigarettes smoked in household by anyone else during pregnancy	None	14	56	1.0	-
	Low	4	12	1.28	0.34 - 4.77
	High (> ½pk/da)	3	17	0.70	0.18 - 2.72
Mother consumed any alcohol during pregnancy	No	15	57	1.0	-
	Yes	6	29	0.75	0.27 - 2.06
Mother consumed any wine during pregnancy	No	16	58	1.0	-
	Yes	5	27	0.65	0.22 - 1.90
Mother consumed any mixed drinks during pregnancy	No	19	81	1.0	-
	Yes	2	4	2.67	0.33 - 21.6
Number of alcoholic drinks the mother consumed during pregnancy	None	15	57	1.0	-
	Low	4	15	0.98	0.30 - 3.18
	High (> 9)	2	13	0.52	0.10 - 2.67

Exposure Factor	Exposure Level	Number of Cases	Number of Controls	Odds Ratio	95% Confidence Interval
<b>Postnatal Exposure: Leukemia Diagnosis Ages 0 through 19</b>					
Child's exposure to tobacco smoke in the home	No	11	45	1.0	-
	Yes	11	43	1.05	0.40 - 2.74
Average daily number of cigarettes smoked in the home	None	11	45	1.0	-
	Low	6	24	1.03	0.33 - 3.18
	High (1 + pk/da)	5	19	1.08	0.33 - 3.53
<b>Prenatal Exposure: Leukemia Diagnosis Ages 0 through 4</b>					
Mother smoked during pregnancy	No	6	26	1.0	-
	Yes	3	9	1.40	0.29 - 6.79
Average daily number of cigarettes smoked by mother when smoking during pregnancy	None	6	26	1.0	-
	Low	2	5	1.69	0.26 - 11.1
	High (> ½pk/da)	1	4	1.07	0.11 - 10.2
Any regular smoking by anyone else in household during pregnancy	No	7	24	1.0	-
	Yes	2	11	0.58	0.10 - 3.32
Average number of cigarettes smoked in household by anyone else during pregnancy	None	7	24	1.0	-
	Low	1	4	0.78	0.08 - 7.36
	High (> ½pk/da)	1	7	0.46	0.05 - 4.37
Mother consumed any alcohol during pregnancy	No	6	24	1.0	-
	Yes	3	11	1.09	0.26 - 4.62
Mother consumed any wine during pregnancy	No	6	24	1.0	-
	Yes	3	11	1.09	0.26 - 4.62
Mother consumed any mixed drinks during pregnancy	No	8	35	1.0	-
	Yes	1	0	-	-

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<b>Exposure Factor</b>	<b>Exposure Level</b>	<b>Number of Cases</b>	<b>Number of Controls</b>	<b>Odds Ratio</b>	<b>95% Confidence Interval</b>
Number of alcoholic drinks the mother consumed during pregnancy	None	6	24	1.0	-
	Low	2	5	1.52	0.27 - 8.65
	High (>9)	1	6	0.67	0.07 - 6.35
<b>Postnatal Exposure: Leukemia Diagnosis Ages 0 through 4</b>					
Child's exposure to tobacco smoke in the home	No	5	21	1.0	-
	Yes	4	15	1.13	0.25 - 5.10
Average daily number of cigarettes smoked in the home	None	5	21	1.0	-
	Low	2	10	0.88	0.15 - 5.31
	High (1+ pk/da)	2	5	1.59	0.25 - 10.3

**Table 13c. Interview Study Analysis of Exposure to Tobacco Smoke and Alcohol: Nervous System Cancers**

Exposure Factor	Exposure Level	Number of Cases	Number of Controls	Odds Ratio	95% Confidence Interval
<b>Prenatal Exposure: Nervous System Cancer Diagnosis Ages 0 through 19</b>					
Mother smoked during pregnancy	No	13	48	1.0	-
	Yes	4	22	0.66	0.20 - 2.14
Average daily number of cigarettes smoked by mother when smoking during pregnancy	None	13	48	1.0	-
	Low	2	13	0.57	0.12 - 2.64
	High (> ½pk/da)	2	9	0.79	0.15 - 4.10
Any regular smoking by anyone else in household during pregnancy	No	12	33	1.0	-
	Yes	5	36	0.33	0.10 - 1.10
Average number of cigarettes smoked in household by anyone else during pregnancy	None	12	33	1.0	-
	Low	3	22	0.33	0.08 - 1.34
	High (> ½pk/da)	2	14	0.33	0.06 - 1.73
Mother consumed any alcohol during pregnancy	No	15	49	1.0	-
	Yes	2	21	0.28	0.06 - 1.39
Mother consumed any wine during pregnancy	No	15	57	1.0	-
	Yes	2	13	0.54	0.11 - 2.80
Mother consumed any mixed drinks during pregnancy	No	17	63	1.0	-
	Yes	0	7	0	-
Number of alcoholic drinks the mother consumed during pregnancy	None	15	49	1.0	-
	Low	2	11	0.51	0.10 - 2.64
	High (>9)	0	10	0	-



Exposure Factor	Exposure Level	Number of Cases	Number of Controls	Odds Ratio	95% Confidence Interval
<b>Postnatal Exposure: Nervous System Cancer Diagnosis Ages 0 through 19</b>					
Child's exposure to tobacco smoke in the home	Yes	8	38	1.0	-
	No	9	33	0.65	0.21 - 1.98
Average daily number of cigarettes smoked in the home	None	9	33	1.0	-
	Low	5	21	0.74	0.23 - 2.41
	High (1 + pk/da)	3	17	0.49	0.10 - 2.40
<b>Prenatal Exposure: Nervous System Cancer Diagnosis Ages 0 through 4</b>					
Mother smoked during pregnancy	No	7	25	1.0	-
	Yes	1	10	0.32	0.04 - 2.90
Average daily number of cigarettes smoked by mother when smoking during pregnancy	None	7	25	1.0	-
	Low	1	6	0.53	0.06 - 4.61
	High (> ½pk/da)	0	4	0	-
Any regular smoking by anyone else in household during pregnancy	No	7	20	1.0	-
	Yes	1	14	0.16	0.02 - 1.52
Average daily number of cigarettes smoked in household by anyone else during pregnancy	None	7	20	1.0	-
	Low	1	10	0.23	0.03 - 2.12
	High (1 + pk/da)	0	4	0	-
Mother consumed any alcohol during pregnancy	No	7	28	1.0	-
	Yes	1	7	0.51	0.05 - 4.93
Mother consumed any wine during pregnancy	No	7	31	1.0	-
	Yes	1	4	1.00	0.07 - 13.7

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<b>Exposure Factor</b>	<b>Exposure Level</b>	<b>Number of Cases</b>	<b>Number of Controls</b>	<b>Odds Ratio</b>	<b>95% Confidence Interval</b>
Mother consumed any mixed drinks during pregnancy	No	8	34	1.0	-
	Yes	0	1	0	-
Number of alcoholic drinks the mother consumed during pregnancy	None	7	28	1.0	-
	Low	1	4	0.87	0.08 - 9.22
	High (>9)	0	3	0	-
<b>Postnatal Exposure: Nervous System Cancer Diagnosis Ages 0 through 4</b>					
Child's exposure to tobacco smoke in the home	No	7	20	1.0	-
	Yes	1	15	0.15	0.02 - 1.36
Average daily number of cigarettes smoke in the home	None	7	20	1.0	-
	Low	1	9	0.27	0.03 - 2.36
	High (1+ pk/da)	0	6	0	-

**Table 13d. Interview Study Analysis of Exposure to Tobacco Smoke and Alcohol:  
Brain and Central Nervous System Cancers**

Exposure Factor	Exposure Level	Number of Cases	Number of Controls	Odds Ratio	95% Confidence Interval
<b>Prenatal Exposure: Brain and Central Nervous System Cancer Diagnosis Ages 0 through 19</b>					
Mother smoked during pregnancy	No	8	34	1.0	-
	Yes	4	17	0.90	0.26 - 3.17
Average daily number of cigarettes smoked by mother when smoking during pregnancy	None	8	34	1.0	-
	Low	2	10	0.78	0.16 - 3.82
	High (> ½pk/da)	2	7	1.12	0.19 - 6.51
Any regular smoking by anyone else in household during pregnancy	No	7	22	1.0	-
	Yes	5	28	0.49	0.13 - 1.80
Average daily number of cigarettes smoked in household by anyone else during pregnancy	None	7	22	1.0	-
	Low	3	16	0.51	0.11 - 2.32
	High (> ½pk/da)	2	12	0.45	0.08 - 2.54
Mother consumed any alcohol during pregnancy	No	10	33	1.0	-
	Yes	2	18	0.32	0.06 - 1.69
Mother consumed any wine during pregnancy	No	10	39	1.0	-
	Yes	2	12	0.59	0.11 - 3.15
Mother consumed any mixed drinks during pregnancy	No	12	45	1.0	-
	Yes	0	6	0	-
Number of alcoholic drinks the mother consumed during pregnancy	None	10	33	1.0	-
	Low	2	9	0.61	0.11 - 3.39
	High (> 9)	0	9	0	-

Exposure Factor	Exposure Level	Number of Cases	Number of Controls	Odds Ratio	95% Confidence Interval
<b>Postnatal Exposure: Brain and Central Nervous System Cancer Diagnosis Ages 0 through 19</b>					
Child's exposure to tobacco smoke in the home	No	4	23	1.0	-
	Yes	8	29	1.30	0.35 - 4.80
Average daily number of cigarettes smoked in the home	None	4	23	1.0	-
	Low	5	15	1.45	0.37 - 5.67
	High (1 + pk/da)	3	14	1.00	0.17 - 5.69
<b>Prenatal Exposure: Brain and Central Nervous System Cancer Diagnosis Ages 0 through 4</b>					
Mother smoked during pregnancy	No	2	11	1.0	-
	Yes	1	5	0.72	0.06 - 9.12
Average daily number of cigarettes smoked by mother when smoking during pregnancy	None	2	11	1.0	-
	Low	1	3	1.11	0.10 - 12.8
	High (> ½pk/da)	0	2	0	-
Any regular smoking by anyone else in household during pregnancy	No	2	9	1.0	-
	Yes	1	6	0.47	0.03 - 7.50
Average daily number of cigarettes smoked in household by anyone else during pregnancy	None	2	9	1.0	-
	Low	1	4	0.64	0.05 - 8.51
	High (> ½pk/da)	0	2	0	-
Mother consumed any alcohol during pregnancy	No	2	12	1.0	-
	Yes	1	4	1.00	0.07 - 13.7
Mother consumed any wine during pregnancy	No	2	13	1.0	-
	Yes	1	3	1.63	0.08 - 34.6
Mother consumed any mixed drinks during pregnancy	No	3	16	1.0	-
	Yes	0	0	-	-

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<b>Exposure Factor</b>	<b>Exposure Level</b>	<b>Number of Cases</b>	<b>Number of Controls</b>	<b>Odds Ratio</b>	<b>95% Confidence Interval</b>
Number of alcoholic drinks the mother consumed during pregnancy	None	2	12	1.0	-
	Low	1	2	2.00	0.11 - 37.8
	High (>9)	0	2	0	-
<b>Postnatal Exposures: Brain and Central Nervous System Cancer Diagnosis Ages 0 through 4</b>					
Child's exposure to tobacco smoke in the home	No	2	10	1.0	-
	Yes	1	6	0.56	0.05 - 6.44
Average daily number of cigarettes smoked in the home	None	2	10	1.0	-
	Low	1	3	1.03	0.09 - 11.6
	High (1+ pk/da)	0	3	0	-

**Table 14. Interview Study Household-related Exposures: Chemicals, Animals  
and Electromagnetic Fields (EMFs)**

Characteristic	Cases (n = 40)		Controls (n = 159)	
	Number	Percent	Number	Percent
<b>Prenatal Exposure</b>				
<b>Indoor use of pesticides during pregnancy:</b>				
Yes	4	10.0	20	12.6
No	34	85.0	134	84.3
Unknown	2	5.0	5	3.1
<b><u>Among households using indoor , frequency of treatment:</u></b>				
Monthly	2	50.0	3	15.0
Less than monthly	2	50.0	17	85.0
<b><u>Mother applied pesticide some or all of these treatments</u></b>	2	50.0	2	10.0
<b>Yard or garden use of pesticides or herbicides during pregnancy:</b>				
Yes	14	35.0	58	36.5
No	23	57.5	94	59.1
Unknown	3	7.5	7	4.4
<b><u>Among households using outdoor pesticides or herbicides, frequency of treatment:</u></b>				
Monthly	4	28.6	3	5.2
Less than monthly	10	71.4	52	89.7
Unknown	0	0.0	3	5.2
<b><u>Mother applied some or all of these treatments</u></b>	0	0.0	3	5.2

Characteristic	Cases (n = 40)		Controls (n =159)	
	Number	Percent	Number	Percent
<b>Use of pest strips at home during pregnancy:</b>				
Yes	1	2.5	7	4.4
No	37	92.5	146	91.8
Unknown	2	5.0	6	3.8
<b>Use of flea collars on pets at home during pregnancy:</b>				
Yes	12	30.0	52	32.7
No	26	65.0	102	64.2
Unknown	2	5.0	5	3.1
<b>Use of to oil based paint, paint thinners, brush cleaners or furniture strippers at home during pregnancy:</b>				
Yes	9	22.5	37	23.3
No	27	67.5	118	74.2
Unknown	4	10.0	4	2.5
<b><u>Among households using paints or solvent, frequency of use:</u></b>				
Weekly or more	0	0.0	2	5.4
Monthly	1	11.1	1	2.7
Less than monthly	8	88.9	34	91.9
<b>Car repair at home during pregnancy:</b>				
Yes	10	25.0	28	17.6
No	28	70.0	128	80.5
Unknown	2	5.0	3	1.9
<b><u>Among house holds repairing cars, frequency of activity:</u></b>				
Weekly or more	0	0.0	8	28.6
Monthly	2	20.0	2	7.1
Less than monthly	8	80.0	18	64.3

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Characteristic	Cases (n = 40)		Controls (n =159)	
	Number	Percent	Number	Percent
<b>Use of fingernail polish or remover at home during pregnancy:</b>				
Yes	23	57.5	99	62.3
No	15	37.5	57	35.9
Unknown	2	5.0	3	1.9
<b><u>Among households using nail polish or remover, frequency of use:</u></b>				
Weekly or more	6	26.1	34	34.3
Monthly	10	43.5	33	33.3
Less than monthly	7	30.4	32	32.3
<b>Use of moth balls or moth crystals at home during pregnancy:</b>				
Yes	6	15.0	34	21.4
No	32	80.0	121	76.1
Unknown	2	5.0	4	2.5
<b>Use of wood cleaner or furniture polish at home during pregnancy:</b>				
Yes	36	90.0	141	88.7
No	2	5.0	15	9.4
Unknown	2	5.0	3	1.9
<b><u>Among households using wood cleaners, frequency of use:</u></b>				
Weekly or more	24	66.7	109	77.3
Monthly	11	30.6	24	17.0
Less than monthly	1	2.8	8	5.7
<b>Mother regularly used electric blanket or electric mattress pad during pregnancy:</b>				
Yes	1	2.5	9	5.7
No	37	92.5	146	91.8
Unknown	2	5.0	4	2.5

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Characteristic	Cases (n = 40)		Controls (n = 159)	
	Number	Percent	Number	Percent
<b>Mother regularly used heated water bed during pregnancy:</b>				
Yes	2	5.0	5	3.1
No	36	90.0	151	95.0
Unknown	2	5.0	3	1.9
<b>Postnatal Exposure</b>				
<b>Indoor use of pesticides during childhood:</b>				
Yes	9	22.5	39	24.5
No	30	75.0	120	75.5
Unknown	1	2.5	0	0
<b><u>Among indoor pesticide users, average annual frequency of use</u></b>	3.1		2.8	
<b><u>Applicator of indoor pesticides:</u></b>				
Informant	2	22.2	7	17.9
Professionals	5	55.6	20	51.3
Study Subject	0	0	0	0
Other	1	11.1	9	23.1
Multiple	1	11.1	3	7.7
<b>Yard or garden use of pesticides or herbicides during childhood:</b>				
Yes	20	50.0	105	66.0
No	18	45.0	53	33.3
Unknown	2	5.0	1	0.6
<b><u>Among outdoor yard or garden treatment users, average annual frequency of use</u></b>	3.4		3.6	
<b><u>Applicator of outdoor yard or garden treatment:</u></b>				
Informant	0	0	5	4.8
Professionals	4	20.0	25	23.8
Study Subject	0	0	0	0
Other	12	60.0	64	60.9
Multiple	4	20.0	11	10.5

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Characteristic	Cases (n = 40)		Controls (n = 159)	
	Number	Percent	Number	Percent
<b>Use of pest strips at home during childhood:</b>				
Yes	1	2.5	11	6.9
No	38	95.0	148	93.1
Unknown	1	2.5	0	0
<b>Use of oil based paints, paint thinners, brush cleaners, or finish strippers at home during childhood:</b>				
Yes	10	25.0	65	40.9
No	29	72.5	94	59.1
Unknown	1	2.5	0	0
<b><u>Among households using paints or solvents, annual frequency of use</u></b>	1.5		8.2	
<b>Car repair at home during childhood:</b>				
Yes	14	35.0	42	26.4
No	25	62.5	117	73.6
Unknown	1	2.5	0	0
<b><u>Among households repairing cars, annual frequency of activity</u></b>	10.4		23.8	
<b>Use of fingernail polish or remover at home during childhood:</b>				
Yes	27	67.5	116	73.0
No	12	30.0	43	27.0
Unknown	1	2.5	0	0
<b><u>Among households using nail polish or remover, annual frequency of use</u></b>	22.1		32.4	
<b>Use of moth balls or crystals at the home during childhood:</b>				
Yes	8	20.0	28	17.6
No	31	77.5	130	81.8
Unknown	1	2.5	1	0.6

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Characteristic	Cases (n = 40)		Controls (n =159)	
	Number	Percent	Number	Percent
<b>Use of wood cleaner or furniture polish at home during childhood:</b>				
Yes	37	92.5	150	94.3
No	2	5.0	9	5.7
Unknown	1	2.5	0	0
<b><u>Among households using wood cleaners or furniture polish, annual frequency of use</u></b>	47.7		56.1	
<b>Child ever lived on a farm:</b>				
Yes	0	0	3	1.9
No	39	97.5	156	98.1
Unknown	1	2.5	0	0
<b>Child was regularly around cows, pigs, or horses:</b>				
Yes	0	0	7	4.4
No	39	97.5	152	95.6
Unknown	1	2.5	0	0
<b>Child was regularly around chickens, geese or ducks:</b>				
Yes	1	2.5	8	5.0
No	38	95.0	151	95.0
Unknown	1	2.5	0	0
<b>Child lived with a pet:</b>				
Yes	29	72.5	119	74.8
No	10	25.0	40	25.2
Unknown	1	2.5	0	0
<b>Child lived with a dog:</b>				
Yes	24	60.0	90	56.6
No	15	37.5	69	43.4
Unknown	1	2.5	0	0
<b>Child lived with a cat:</b>				
Yes	8	20.0	54	34.0
No	31	77.5	105	66.0
Unknown	1	2.5	0	0

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Characteristic	Cases (n = 40)		Controls (n =159)	
	Number	Percent	Number	Percent
<b>Child lived with a pet other than a dog or cat:</b>				
Yes	12	30.0	60	37.7
No	27	67.5	99	62.3
Unknown	1	2.5	0	0
<b>Child lived with a household pet who used flea collars:</b>				
Yes	19	47.5	81	50.9
No	20	50.0	76	47.8
Unknown	1	2.5	2	1.3
<b>Child regularly used an electric blanket or mattress pad:</b>				
Yes	2	5.0	4	2.5
No	37	92.5	155	97.5
Unknown	1	2.5	0	0
<b>Child regularly used a heated water bed:</b>				
Yes	3	7.5	2	1.3
No	36	90.0	157	98.7
Unknown	1	2.5	0	0

**Table 15a. Interview Study Analysis of Household-related Exposures: Chemicals, Animals, and EMFs:  
Leukemia and Nervous System Cancers**

<b>Exposure Factor</b>	<b>Exposure Level</b>	<b>Number of Cases</b>	<b>Number of Controls</b>	<b>Odds Ratio</b>	<b>95% Confidence Interval</b>
<b>Prenatal Exposure: Leukemia and Nervous System Cancer Diagnosis Ages 0 through 19</b>					
Pesticides used indoors at home during pregnancy	No	34	134	1.0	-
	Yes	4	20	0.70	0.22 - 2.25
Pesticides or herbicides used outdoors during pregnancy	No	23	94	1.0	-
	Yes	14	58	0.90	0.43 - 1.90
Pest strips used at home during pregnancy	No	37	146	1.0	-
	Yes	1	7	0.67	0.08 - 5.54
Flea collars used on pets at home during pregnancy	No	26	102	1.0	-
	Yes	12	52	0.79	0.35 - 1.74
Oil based paint, paint thinners, brush cleaners or furniture strippers used at home during pregnancy	No	27	118	1.0	-
	Yes	9	37	1.10	0.47 - 2.55
Car repair at home during pregnancy	No	28	128	1.0	-
	Yes	10	28	1.53	0.67 - 3.49
Fingernail polish or remover used at home during pregnancy	No	15	57	1.0	-
	Yes	23	99	0.88	0.42 - 1.81
Moth balls or moth crystals used at home during pregnancy	No	32	121	1.0	-
	Yes	6	34	0.67	0.25 - 1.76
Wood cleaner or furniture polish used at home during pregnancy	No	2	15	1.0	-
	Yes	36	141	1.80	0.36 - 8.98

<b>Exposure Factor</b>	<b>Exposure Level</b>	<b>Number of Cases</b>	<b>Number of Controls</b>	<b>Odds Ratio</b>	<b>95% Confidence Interval</b>
Mother regularly used electric blanket or electric mattress pad during pregnancy	No Yes	37 1	146 9	1.0 0.48	- 0.06 - 4.01
Mother regular used heated water bed during pregnancy	No Yes	36 2	151 5	1.0 2.46	- 0.31 - 19.7
Mother regular used electric blanket, electric mattress pad, or heated water bed during pregnancy	No Yes	35 3	141 14	1.0 0.98	- 0.25 - 3.79
<b>Postnatal Exposure: Leukemia and Nervous System Cancer Diagnosis Ages 0 through 19</b>					
Pesticides used indoors at home during childhood	No Yes	30 9	120 39	1.0 0.90	- 0.39 - 2.08
Pesticides or herbicides used outdoors during childhood	No Yes	18 20	53 105	1.0 0.52	- 0.25 - 1.08
Average annual use of yard or garden treatments during childhood	None Low High (3+ /yr)	18 10 10	53 54 51	1.0 0.51 0.54	- 0.21 - 1.23 0.22 - 1.30
Pest strips used at home during childhood	No Yes	38 1	148 11	1.0 0.35	- 0.04 - 2.79
Oil based paints, thinner, brush cleaner or strippers used at home during childhood	No Yes	29 10	94 65	1.0 0.44	- 0.19 - 1.02
Car repair at home during childhood	No Yes	25 14	117 42	1.0 1.53	- 0.72 - 3.25

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<b>Exposure Factor</b>	<b>Exposure Level</b>	<b>Number of Cases</b>	<b>Number of Controls</b>	<b>Odds Ratio</b>	<b>95% Confidence Interval</b>
Average annual frequency of car repairs at home during childhood	None	25	117	1.0	-
	Low	7	17	1.89	0.70 - 5.09
	High (4+ /yr)	7	25	1.27	0.49 - 3.33
Fingernail polish or remover used at home during childhood	No	12	43	1.0	-
	Yes	27	116	0.82	0.39 - 1.74
Average monthly frequency of fingernail polish or remover used at home during childhood	None	12	43	1.0	-
	Low	13	55	0.86	0.37 - 2.01
	High (>1/mo)	14	61	0.79	0.33 - 1.88
Moth balls or crystals used at home during childhood	No	31	130	1.0	-
	Yes	8	28	1.17	0.49 - 2.80
Wood cleaner or furniture polish used at home during childhood	No	2	9	1.0	-
	Yes	37	150	0.80	0.10 - 6.12
Average weekly use of wood cleaner or furniture polish at home during childhood	None/Low	35	141	1.0	-
	High (>1/wk)	4	18	0.88	0.28 - 2.73
Child lived on a farm	No	39	156	1.0	-
	Yes	0	3	0	-
Child was regularly around cows, pigs, or horses	No	39	152	1.0	-
	Yes	0	7	0	-
Child was regularly around chickens, geese, or ducks	No	38	151	1.0	-
	Yes	1	8	0.45	0.05 - 4.00
Child lived with a pet	No	10	40	1.0	-
	Yes	29	119	0.90	0.39 - 2.06

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<b>Exposure Factor</b>	<b>Exposure Level</b>	<b>Number of Cases</b>	<b>Number of Controls</b>	<b>Odds Ratio</b>	<b>95% Confidence Interval</b>
Child lived with a dog	No	15	69	1.0	-
	Yes	24	90	1.16	0.54 - 2.49
Child lived with a cat	No	31	105	1.0	-
	Yes	8	54	0.48	0.21 - 1.13
Child lived with a pet other than a dog or cat	No	27	99	1.0	-
	Yes	12	60	0.69	0.30 - 1.56
Child lived with a pet who wore flea collars	No	20	76	1.0	-
	Yes	19	81	0.83	0.41 - 1.69
Child regularly used an electric blanket or mattress pad	No	37	155	1.0	-
	Yes	2	4	2.00	0.37 - 10.9
Child regularly used a heated water bed	No	36	157	1.0	-
	Yes	3	2	9.83	0.99 - 97.2
Child regularly used an electric blanket, mattress pad, or heated water bed	No	35	153	1.0	-
	Yes	4	6	3.15	0.76 - 13.0
<b>Prenatal Exposure: Leukemia and Nervous System Cancer Diagnosis Ages 0 through 4</b>					
Pesticides used indoors at home during pregnancy	No	16	60	1.0	-
	Yes	1	9	0.42	0.05 - 3.39
Pesticides or herbicides used outdoors during pregnancy	No	8	37	1.0	-
	Yes	9	31	1.15	0.40 - 3.32
Pest strips used at home during pregnancy	No	16	64	1.0	-
	Yes	1	4	1.00	0.11 - 8.95
Flea collars used on pets at home during pregnancy	No	9	42	1.0	-
	Yes	8	27	1.21	0.38 - 3.79

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<b>Exposure Factor</b>	<b>Exposure Level</b>	<b>Number of Cases</b>	<b>Number of Controls</b>	<b>Odds Ratio</b>	<b>95% Confidence Interval</b>
Oil based paint, paint thinners, brush cleaners or furniture strippers used at home during pregnancy	No	11	56	1.0	-
	Yes	6	13	2.31	0.70 - 7.60
Car repair at home during pregnancy	No	14	57	1.0	-
	Yes	3	13	0.90	0.22 - 3.70
Fingernail polish or remover used at home during pregnancy	No	8	25	1.0	-
	Yes	9	45	0.59	0.20 - 1.78
Moth balls or moth crystals used at home during pregnancy	No	17	58	1.0	-
	Yes	0	11	0	-
Wood cleaner or furniture polish used at home during pregnancy	No	2	9	1.0	-
	Yes	15	61	0.83	0.13 - 5.46
Mother regularly used electric blanket or electric mattress pad during pregnancy	No	16	68	1.0	-
	Yes	1	2	2.00	0.18 - 22.1
Mother regularly used heated water bed during pregnancy	No	16	65	1.0	-
	Yes	1	5	1.00	0.07 - 13.7
Mother regularly used electric blanket, electric mattress pad, or heated water bed during pregnancy	No	15	63	1.0	-
	Yes	2	7	1.43	0.24 - 8.65
<b>Postnatal Exposure: Leukemia and Nervous System Cancer Diagnosis Ages 0 through 4</b>					
Pesticides used indoors at home during childhood	No	16	60	1.0	-
	Yes	1	11	0.35	0.04 - 2.79
Pesticides or herbicides used outdoors during childhood	No	7	26	1.0	-
	Yes	9	44	0.66	0.21 - 2.05

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<b>Exposure Factor</b>	<b>Exposure Level</b>	<b>Number of Cases</b>	<b>Number of Controls</b>	<b>Odds Ratio</b>	<b>95% Confidence Interval</b>
Average annual use of yard or garden treatments during childhood	None	7	26	1.0	-
	Low	6	19	1.07	0.29 - 3.92
	High (3+ /yr)	3	25	0.37	0.08 - 1.67
Pest strips used at home during childhood	No	16	67	1.0	-
	Yes	1	4	1.00	0.10 - 10.1
Oil based paints, thinner, brush cleaner or strippers used at home during childhood	No	16	49	1.0	-
	Yes	1	22	0.13	0.02 - 1.04
Car repair done at home during childhood	No	14	58	1.0	-
	Yes	3	13	0.91	0.23 - 3.62
Average annual frequency of car repairs at home during childhood	None	14	58	1.0	-
	Low	2	0	-	-
	High (4+ /yr)	1	13	0.25	0.03 - 2.12
Fingernail polish or remover used at home during childhood	No	8	23	1.0	-
	Yes	9	48	0.52	0.18 - 1.54
Average monthly frequency of fingernail polish or remover used at home during childhood	None	8	23	1.0	-
	Low	5	27	0.55	0.16 - 1.85
	High (> 1/mo)	4	21	0.49	0.13 - 1.91
Moth balls or crystals use at home during childhood	No	17	59	1.0	-
	Yes	0	11	0	-
Wood cleaner or furniture polish used at home during childhood	No	2	9	1.0	-
	Yes	15	62	0.80	0.11 - 6.12
Average weekly use of wood cleaner or furniture polish in the home during childhood	None/Low	14	64	1.0	-
	High (> 1/wk)	3	7	1.94	0.42 - 9.07

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<b>Exposure Factor</b>	<b>Exposure Level</b>	<b>Number of Cases</b>	<b>Number of Controls</b>	<b>Odds Ratio</b>	<b>95% Confidence Interval</b>
Child lived on a farm	No Yes	17 0	71 0	1.0 -	- -
Child was regularly around cows, pigs, or horses	No Yes	17 0	69 2	1.0 0	- -
Child was regularly around chickens, geese, or ducks	No Yes	17 0	69 2	1.0 0	- -
Child lived with a pet	No Yes	7 10	25 46	1.0 0.70	- 0.24 - 2.01
Child lived with a dog	No Yes	8 9	35 36	1.0 0.94	- 0.31 - 2.87
Child lived with a cat	No Yes	13 4	57 14	1.0 1.20	- 0.33 - 4.35
Child lived with a pet other than a dog or cat	No Yes	14 3	59 12	1.0 1.11	- 0.27 - 4.59
Child lived with a pet who wore flea collars	No Yes	10 7	40 29	1.0 0.83	- 0.28 - 2.43
Child regularly used an electric blanket or mattress pad	No Yes	17 0	70 1	1.0 0	- -
Child regularly used a heated water bed	No Yes	17 0	71 0	1.0 -	- -
Child regularly used an electric blanket, mattress pad, or heated water bed	No Yes	17 0	70 1	1.0 0	- -

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**Table 15b. Interview Study Analysis of Household-related Exposures: Chemicals, Animals, and EMFs: Leukemia**

<b>Exposure Factor</b>	<b>Exposure Level</b>	<b>Number of Cases</b>	<b>Number of Controls</b>	<b>Odds Ratio</b>	<b>95% Confidence Interval</b>
<b>Prenatal Exposure: Leukemia Diagnosis Ages 0 through 19</b>					
Pesticides used indoors at home during pregnancy	No	19	74	1.0	-
	Yes	2	12	0.59	0.12 - 2.83
Pesticides or herbicides used outdoors during pregnancy	No	12	46	1.0	-
	Yes	8	38	0.73	0.27 - 1.99
Pest strips used at home during pregnancy	No	21	78	1.0	-
	Yes	0	5	0	-
Flea collars used on pets at home during pregnancy	No	17	62	1.0	-
	Yes	4	23	0.56	0.17 - 1.87
Oil based paint, paint thinners, brush cleaners or furniture strippers used at home during pregnancy	No	17	66	1.0	-
	Yes	3	19	0.63	0.17 - 2.39
Car repair at home during pregnancy	No	15	74	1.0	-
	Yes	6	12	2.20	0.75 - 6.51
Fingernail polish or remover used at home during pregnancy	No	10	32	1.0	-
	Yes	11	54	0.65	0.24 - 1.75
Moth balls or moth crystals used at home during pregnancy	No	18	65	1.0	-
	Yes	3	21	0.55	0.15 - 2.06
Wood cleaner or furniture polish used at home during pregnancy	No	2	9	1.0	-
	Yes	19	77	1.15	0.22 - 5.89

<b>Exposure Factor</b>	<b>Exposure Level</b>	<b>Number of Cases</b>	<b>Number of Controls</b>	<b>Odds Ratio</b>	<b>95% Confidence Interval</b>
Mother regularly used electric blanket or electric mattress pad during pregnancy	No Yes	21 0	79 6	1.0 0	- -
Mother regularly used heated water bed during pregnancy	No Yes	20 1	86 0	1.0 -	- -
Mother regularly used electric blanket, electric mattress pad, or heated water bed during pregnancy	No Yes	20 1	79 6	1.0 0.76	- 0.09 - 6.51
<b>Postnatal Exposure: Leukemia Diagnosis Ages 0 through 19</b>					
Pesticides used indoors at home during childhood	No Yes	18 4	65 23	1.0 0.62	- 0.19 - 2.05
Pesticides or herbicides used outdoors during childhood	No Yes	10 12	28 60	1.0 0.55	- 0.21 - 1.43
Average annual use of yard or garden treatments during childhood	None Low High (3+ /yr)	10 4 8	28 29 31	1.0 0.39 0.70	- 0.11 - 1.38 0.24 - 2.07
Pest strips used at home during childhood	No Yes	22 0	81 7	1.0 0	- -
Oil based paints, thinner, brush cleaner or strippers used at home during childhood	No Yes	16 6	48 40	1.0 0.42	- 0.14 - 1.24
Car repair done at home during childhood	No Yes	13 9	70 18	1.0 2.59	- 0.96 - 6.95

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Exposure Factor	Exposure Level	Number of Cases	Number of Controls	Odds Ratio	95% Confidence Interval
Average annual frequency of car repairs at home during childhood	None	13	70	1.0	-
	Low	5	9	2.84	0.82 - 9.86
	High (4+ /yr)	4	9	2.30	0.57 - 9.22
Fingernail polish or remover used at home during childhood	No	10	20	1.0	-
	Yes	12	68	0.38	0.14 - 0.97
Average monthly frequency of fingernail polish or remover used at home during childhood	None	10	20	1.0	-
	Low	6	34	0.39	0.13 - 1.18
	High (>1/mo)	6	34	0.35	0.11 - 1.16
Moth balls or crystals used at home during childhood	No	18	69	1.0	-
	Yes	4	19	0.81	0.25 - 2.65
Wood cleaner or furniture polish used at home during childhood	No	2	3	1.0	-
	Yes	20	85	0.32	0.04 - 2.35
Average weekly use of wood cleaner or furniture polish at home during childhood	None/Low	19	81	1.0	-
	High (>1/wk)	3	7	1.85	0.43 - 7.99
Child lived on a farm	No	22	86	1.0	-
	Yes	0	2	0	-
Child was regularly around cows, pigs, or horses	No	22	86	1.0	-
	Yes	0	2	0	-
Child was regularly around chickens, geese, or ducks	No	22	87	1.0	-
	Yes	0	1	0	-
Child lived with a pet	No	7	27	1.0	-
	Yes	15	61	0.94	0.33 - 2.70

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<b>Exposure Factor</b>	<b>Exposure Level</b>	<b>Number of Cases</b>	<b>Number of Controls</b>	<b>Odds Ratio</b>	<b>95% Confidence Interval</b>
Child lived with a dog	No	10	45	1.0	-
	Yes	12	43	1.30	0.47 - 3.56
Child lived with a cat	No	19	63	1.0	-
	Yes	3	25	0.41	0.11 - 1.49
Child lived with a pet other than a dog or cat	No	15	55	1.0	-
	Yes	7	33	0.75	0.26 - 2.18
Child lived with a pet who wore flea collars	No	14	46	1.0	-
	Yes	8	42	0.60	0.21 - 1.67
Child regularly used an electric blanket or mattress pad	No	20	87	1.0	-
	Yes	2	1	8.00	0.72 - 88.2
Child regularly used a heated water bed	No	20	88	1.0	-
	Yes	2	0	-	-
Child regularly used an electric blanket, mattress pad, or heated water bed	No	19	87	1.0	-
	Yes	3	1	12.0	1.25 - 115
<b>Prenatal Exposure: Leukemia Diagnosis Ages 0 through 4</b>					
Pesticides used indoors at home during pregnancy	No	8	30	1.0	-
	Yes	1	5	0.74	0.08 - 6.87
Pesticides or herbicides used outdoors during pregnancy	No	3	17	1.0	-
	Yes	6	17	2.04	0.39 - 10.7
Pest strips used at home during pregnancy	No	9	30	1.0	-
	Yes	0	3	0	-
Flea collars used on pets at home during pregnancy	No	7	26	1.0	-
	Yes	2	9	0.80	0.14 - 4.52

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<b>Exposure Factor</b>	<b>Exposure Level</b>	<b>Number of Cases</b>	<b>Number of Controls</b>	<b>Odds Ratio</b>	<b>95% Confidence Interval</b>
Oil based paint, paint thinners, brush cleaners or furniture strippers used at home during pregnancy	No	7	30	1.0	-
	Yes	2	4	2.05	0.33 - 12.7
Car repair at home during pregnancy	No	7	30	1.0	-
	Yes	2	5	1.77	0.28 - 11.1
Fingernail polish or remover used at home during pregnancy	No	6	12	1.0	-
	Yes	3	23	0.23	0.04 - 1.25
Moth balls or moth crystals used at home during pregnancy	No	9	27	1.0	-
	Yes	0	8	0	-
Wood cleaner or furniture polish used at home during pregnancy	No	2	4	1.0	-
	Yes	7	31	0.41	0.05 - 3.07
Mother regularly used electric blanket or electric mattress pad during pregnancy	No	9	34	1.0	-
	Yes	0	1	0	-
Mother regularly used heated water bed during pregnancy	No	9	35	1.0	-
	Yes	0	0	-	-
Mother regularly used electric blanket, electric mattress pad, or heated water bed during pregnancy	No	9	34	1.0	-
	Yes	0	1	0	-
<b>Postnatal Exposure: Leukemia Diagnosis Ages 0 through 4</b>					
Pesticides used indoors at home during childhood	No	9	30	1.0	-
	Yes	0	6	0	-
Pesticides or herbicides used outdoors during childhood	No	4	12	1.0	-
	Yes	5	24	0.58	0.12 - 2.80

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<b>Exposure Factor</b>	<b>Exposure Level</b>	<b>Number of Cases</b>	<b>Number of Controls</b>	<b>Odds Ratio</b>	<b>95% Confidence Interval</b>
Average annual use of yard or garden treatments during childhood	None	4	12	1.0	-
	Low	2	10	0.56	0.08 - 3.86
	High (3+ /yr)	3	14	0.59	0.10 - 3.47
Pest strips used at home during childhood	No	9	33	1.0	-
	Yes	0	3	0	-
Oil based paints, thinner, brush cleaner or strippers used at home during childhood	No	8	24	1.0	-
	Yes	1	12	0.27	0.03 - 2.32
Car repair at home during childhood	No	7	32	1.0	-
	Yes	2	4	2.17	0.35 - 13.5
Average annual frequency of car repairs at home during childhood	None	7	32	1.0	-
	Low	2	0	-	-
	High (4+ /yr)	0	4	0	-
Fingernail polish or remover used at home during childhood	No	6	10	1.0	-
	Yes	3	26	0.19	0.04 - 1.02
Average monthly frequency of fingernail polish or remover used at home during childhood	None	6	10	1.0	-
	Low	2	15	0.23	0.04 - 1.36
	High (> 1/mo)	1	11	0.13	0.01 - 1.52
Moth balls or crystals used at home during childhood	No	9	28	1.0	-
	Yes	0	8	0	-
Wood cleaner or furniture polish used at home during childhood	No	2	3	1.0	-
	Yes	7	33	0.32	0.04 - 2.35
Average weekly use of wood cleaner or furniture polish at home during childhood	None/Low	7	33	1.0	-
	High (> 1/wk)	2	3	3.15	0.43 - 23.4

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<b>Exposure Factor</b>	<b>Exposure Level</b>	<b>Number of Cases</b>	<b>Number of Controls</b>	<b>Odds Ratio</b>	<b>95% Confidence Interval</b>
Child lived on a farm	No Yes	9 0	36 0	1.0 -	- -
Child was regularly around cows, pigs, or horses	No Yes	9 0	36 0	1.0 -	- -
Child was regularly around chickens, geese, or ducks	No Yes	9 0	36 0	1.0 -	- -
Child lived with a pet	No Yes	4 5	16 20	1.0 1.00	- 0.24 - 4.11
Child lived with a dog	No Yes	5 4	21 15	1.0 1.14	- 0.23 - 5.67
Child lived with a cat	No Yes	8 1	30 6	1.0 0.65	- 0.07 - 5.72
Child lived with a pet other than a dog or a cat	No Yes	7 2	28 8	1.0 1.00	- 0.18 - 5.65
Child lived with a pet who wore flea collars	No Yes	6 3	24 12	1.0 1.00	- 0.22 - 4.54
Child regularly used an electric blanket or mattress pad	No Yes	9 0	36 0	1.0 -	- -
Child regularly used a heated water bed	No Yes	9 0	36 0	1.0 -	- -
Child regularly used an electric blanket, mattress pad, or heated water bed	No Yes	9 0	36 0	1.0 -	- -

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**Table 15c. Interview Study Analysis of Household-related Exposures: Chemicals, Animals, and EMFs:  
Nervous System Cancers**

<b>Exposure Factor</b>	<b>Exposure Level</b>	<b>Number of Cases</b>	<b>Number of Controls</b>	<b>Odds Ratio</b>	<b>95% Confidence Interval</b>
<b>Prenatal Exposure: Nervous System Cancer Diagnosis Ages 0 through 19</b>					
Pesticides used indoors at home during pregnancy	No	15	60	1.0	-
	Yes	2	8	0.89	0.15 - 5.17
Pesticides or herbicides used outdoors during pregnancy	No	11	48	1.0	-
	Yes	6	20	1.18	0.39 - 3.57
Pest strips used at home during pregnancy	No	16	68	1.0	-
	Yes	1	2	2.00	0.18 - 22.1
Flea collars used on pets at home during pregnancy	No	9	40	1.0	-
	Yes	8	29	1.06	0.36 - 3.19
Oil based paint, paint thinners, brush cleaners or furniture strippers used at home during pregnancy	No	10	52	1.0	-
	Yes	6	18	1.77	0.56 - 5.58
Car repair at home during pregnancy	No	13	54	1.0	-
	Yes	4	16	0.98	0.28 - 3.46
Fingernail polish or remover used at home during pregnancy	No	5	25	1.0	-
	Yes	12	45	1.28	0.41 - 3.98
Moth balls or moth crystals used at home during pregnancy	No	14	56	1.0	-
	Yes	3	13	0.86	0.21 - 3.54
Wood cleaner or furniture polish used at home during pregnancy	No	0	6	-	-
	Yes	17	64	-	-

<b>Exposure Factor</b>	<b>Exposure Level</b>	<b>Number of Cases</b>	<b>Number of Controls</b>	<b>Odds Ratio</b>	<b>95% Confidence Interval</b>
Mother regularly used electric blanket or electric mattress pad during pregnancy	No Yes	16 1	67 3	1.0 1.40	- 0.12 - 16.4
Mother regularly used heated water bed during pregnancy	No Yes	16 1	65 5	1.0 1.00	- 0.07 - 13.7
Mother regularly used electric blanket, electric mattress pad, or heated water bed during pregnancy	No Yes	15 2	62 8	1.0 1.19	- 0.20 - 7.21
<b>Postnatal Exposure: Nervous System Cancer Diagnosis Ages 0 through 19</b>					
Pesticides used indoors at home during childhood	No Yes	12 5	55 16	1.0 1.38	- 0.40 - 4.71
Pesticides or herbicides used outdoors during childhood	No Yes	8 8	25 45	1.0 0.50	- 0.17 - 1.49
Average annual use of yard or garden treatments during childhood	None Low High (3+ /yr)	8 6 2	25 25 20	1.0 0.73 0.27	- 0.21 - 2.49 0.05 - 1.44
Pest strips used at home during childhood	No Yes	16 1	67 4	1.0 1.00	- 0.11 - 8.95
Oil based paints, thinner, brush cleaner or strippers used at home during childhood	No Yes	13 4	46 25	1.0 0.46	- 0.12 - 1.81
Car repair at home during childhood	No Yes	12 5	47 24	1.0 0.75	- 0.23 - 2.46

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<b>Exposure Factor</b>	<b>Exposure Level</b>	<b>Number of Cases</b>	<b>Number of Controls</b>	<b>Odds Ratio</b>	<b>95% Confidence Interval</b>
Average annual frequency of car repairs at home during childhood	None	12	47	1.0	-
	Low	2	8	0.90	0.16 - 5.04
	High (4+ /yr)	3	16	0.69	0.17 - 2.75
Fingernail polish or remover used at home during childhood	No	2	23	1.0	-
	Yes	15	48	3.49	0.71 - 17.1
Average monthly frequency of fingernail polish or remover used at home during childhood	None	2	23	1.0	-
	Low	7	21	3.97	0.72 - 21.8
	High (>1/mo)	8	27	3.11	0.58 - 16.8
Moth balls or crystals used at home during childhood	No	13	61	1.0	-
	Yes	4	9	1.95	0.52 - 7.28
Wood cleaner or furniture polish used at home during childhood	No	0	6	-	-
	Yes	17	65	-	-
Average weekly use of wood cleaner or furniture polish at home during childhood	None/Low	16	60	1.0	-
	High (>1/wk)	1	11	0.34	0.04 - 2.75
Child lived on a farm	No	17	70	1.0	-
	Yes	0	1	0	-
Child was regularly around cows, pigs, or horses	No	17	66	1.0	-
	Yes	0	5	0	-
Child was regularly around chickens, geese, or ducks	No	16	64	1.0	-
Child lived with a pet	Yes	1	7	0.52	0.06 - 4.80
	No	3	13	1.0	-
	Yes	14	58	0.82	0.21 - 3.16

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<b>Exposure Factor</b>	<b>Exposure Level</b>	<b>Number of Cases</b>	<b>Number of Controls</b>	<b>Odds Ratio</b>	<b>95% Confidence Interval</b>
Child lived with a dog	No	5	24	1.0	-
	Yes	12	47	1.00	0.31 - 3.17
Child lived with a cat	No	12	42	1.0	-
	Yes	5	29	0.55	0.17 - 1.76
Child lived with a pet other than a dog or cat	No	12	44	1.0	-
	Yes	5	27	0.61	0.17 - 2.16
Child lived with a pet who wore flea collars	No	6	30	1.0	-
	Yes	11	39	1.18	0.41 - 3.42
Child regularly used an electric blanket or mattress pad	No	17	68	1.0	-
	Yes	0	3	0	-
Child regularly used a heated water bed	No	16	69	1.0	-
	Yes	1	2	2.45	0.14 - 42.6
Child regularly used an electric blanket, mattress pad, or heated water bed	No	16	66	1.0	-
	Yes	1	5	0.77	0.08 - 7.76
<b>Prenatal Exposure: Nervous System Cancer Diagnosis Ages 0 through 4</b>					
Pesticides used indoors at home during pregnancy	No	8	30	1.0	-
	Yes	0	4	0	-
Pesticides or herbicides used outdoors during pregnancy	No	5	20	1.0	-
	Yes	3	14	0.68	0.15 - 3.14
Pest strips used at home during pregnancy	No	7	34	1.0	-
	Yes	1	1	4.00	0.25 - 64.0
Flea collars used on pets at home during pregnancy	No	2	16	1.0	-
	Yes	6	18	1.80	0.33 - 9.85

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<b>Exposure Factor</b>	<b>Exposure Level</b>	<b>Number of Cases</b>	<b>Number of Controls</b>	<b>Odds Ratio</b>	<b>95% Confidence Interval</b>
Oil based paint, paint thinners, brush cleaners or furniture strippers used at home during pregnancy	No	4	26	1.0	-
	Yes	4	9	2.53	0.51 - 12.5
Car repair at home during pregnancy	No	7	27	1.0	-
	Yes	1	8	0.41	0.04 - 4.00
Fingernail polish or remover used at home during pregnancy	No	2	13	1.0	-
	Yes	6	22	1.66	0.30 - 9.22
Moth balls or moth crystals used at home during pregnancy	No	8	31	1.0	-
	Yes	0	3	0	-
Wood cleaner or furniture polish used at home during pregnancy	No	0	5	-	-
	Yes	8	30	-	-
Mother regularly used electric blanket or electric mattress pad during pregnancy	No	7	34	1.0	-
	Yes	1	1	4.00	0.25 - 64.0
Mother regularly used heated water bed during pregnancy	No	7	30	1.0	-
	Yes	1	5	1.00	0.07 - 13.7
Mother regularly used electric blanket, electric mattress pad, or heated water bed	No	6	29	1.0	-
	Yes	2	6	1.85	0.28 - 12.4
<b>Postnatal Exposure: Nervous System Cancer Diagnosis Ages 0 through 4</b>					
Pesticides used indoors at home during childhood	No	7	30	1.0	-
	Yes	1	5	0.78	0.08 - 7.28
Pesticides or herbicides used outdoors during childhood	No	3	14	1.0	-
	Yes	4	20	0.76	0.15 - 3.77

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<b>Exposure Factor</b>	<b>Exposure Level</b>	<b>Number of Cases</b>	<b>Number of Controls</b>	<b>Odds Ratio</b>	<b>95% Confidence Interval</b>
Average annual frequency of yard or garden treatments during childhood	None	3	14	1.0	-
	Low	4	9	3.68	0.36 - 37.6
	High (3+ /yr)	0	11	0	-
Pest strips used at home during childhood	No	7	34	1.0	-
	Yes	1	1	4.00	0.25 - 64.0
Oil based paints, thinner, brush cleaner or strippers used at home during childhood	No	8	25	1.0	-
	Yes	0	10	0	-
Car repair at home during childhood	No	7	26	1.0	-
	Yes	1	9	0.37	0.04 - 3.40
Average annual frequency of car repairs at home during childhood	None	7	26	1.0	-
	Low	0	0	-	-
	High (4+ /yr)	1	9	0.37	0.04 - 3.40
Fingernail polish or remover used at home during childhood	No	2	13	1.0	-
	Yes	6	22	1.73	0.28 - 10.5
Average monthly frequency of fingernail polish or remover used at home during childhood	None	2	13	1.0	-
	Low	3	12	1.79	0.23 - 13.8
	High (> 1/mo)	3	10	1.68	0.22 - 12.6
Moth balls or crystals used at home during childhood	No	8	31	1.0	-
	Yes	0	3	0	-
Wood cleaner or furniture polish used at home during childhood	No	0	6	-	-
	Yes	8	29	-	-
Average weekly use of wood cleaner or furniture polish at home during childhood	None/Low	7	31	1.0	-
	High (> 1/wk)	1	4	1.00	0.09 - 11.6

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<b>Exposure Factor</b>	<b>Exposure Level</b>	<b>Number of Cases</b>	<b>Number of Controls</b>	<b>Odds Ratio</b>	<b>95% Confidence Interval</b>
Child lived on a farm	No Yes	8 0	35 0	1.0 -	- -
Child was regularly around cows, pigs, or horses	No Yes	8 0	33 2	1.0 0	- -
Child was regularly around chickens, geese, or ducks	No Yes	8 0	33 2	1.0 0	- -
Child lived with a pet	No Yes	3 5	9 26	1.0 0.44	- 0.10 - 2.06
Child lived with a dog	No Yes	3 5	14 21	1.0 0.77	- 0.16 - 3.66
Child lived with a cat	No Yes	5 3	27 8	1.0 1.95	- 0.34 - 11.2
Child lived with a pet other than a dog or a cat	No Yes	7 1	31 4	1.0 1.40	- 0.12 - 16.4
Child lived with a pet who wore flea collar	No Yes	4 4	16 17	1.0 0.70	- 0.16 - 3.08
Child regularly used an electric blanket or mattress pad	No Yes	8 0	34 1	1.0 0	- -
Child regularly used a heated water bed	No Yes	8 0	35 0	1.0 -	- -
Child regularly used an electric blanket, mattress pad, or heated water bed	No Yes	8 0	34 1	1.0 0	- -

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**Table 15d. Interview Study Analysis of Household-related Exposures: Chemicals, Animals, and EMFs:  
Brain and Central Nervous System Cancers**

<b>Exposure Factor</b>	<b>Exposure Level</b>	<b>Number of Cases</b>	<b>Number of Controls</b>	<b>Odds Ratio</b>	<b>95% Confidence Interval</b>
<b>Prenatal Exposure: Brain and Central Nervous System Cancer Diagnosis Ages 0 through 19</b>					
Pesticides used indoors at home during pregnancy	No	10	44	1.0	-
	Yes	2	6	1.27	0.19 - 8.39
Pesticides or herbicides used outdoors during pregnancy	No	8	38	1.0	-
	Yes	4	12	1.42	0.38 - 5.32
Pest strips used at home during pregnancy	No	12	49	1.0	-
	Yes	0	2	0	-
Flea collars used on pets at home during pregnancy	No	8	31	1.0	-
	Yes	4	19	0.64	0.15 - 2.77
Oil based paint, paint thinners, brush cleaners or furniture strippers used at home during pregnancy	No	8	37	1.0	-
	Yes	3	14	1.00	0.24 - 4.24
Car repair at home during pregnancy	No	9	38	1.0	-
	Yes	3	13	0.88	0.22 - 3.59
Fingernail polish or remover used at home during pregnancy	No	3	16	1.0	-
	Yes	9	35	1.27	0.29 - 5.48
Moth balls or moth crystals used at home during pregnancy	No	9	39	1.0	-
	Yes	3	11	1.09	0.25 - 4.76
Wood cleaner or furniture polish used at home during pregnancy	No	0	3	-	-
	Yes	12	48	-	-

<b>Exposure Factor</b>	<b>Exposure Level</b>	<b>Number of Cases</b>	<b>Number of Controls</b>	<b>Odds Ratio</b>	<b>95% Confidence Interval</b>
Mother regularly used electric blanket or electric mattress pad during pregnancy	No	11	48	1.0	-
	Yes	1	3	1.40	0.12 - 16.4
Mother regularly used heated water bed during pregnancy	No	12	49	1.0	-
	Yes	0	2	0	-
Mother regularly used electric blanket, electric mattress pad, or heated water bed during pregnancy	No	11	46	1.0	-
	Yes	1	5	1.00	0.10 - 10.1
<b>Postnatal Exposure: Brain and Central Nervous System Cancer Diagnosis Ages 0 through 19</b>					
Pesticides used indoors at home during childhood	No	8	39	1.0	-
	Yes	4	13	1.37	0.33 - 5.66
Pesticides or herbicides used outdoors during childhood	No	6	20	1.0	-
	Yes	6	32	0.50	0.14 - 1.80
Average annual frequency of yard or garden treatments during childhood	None	6	20	1.0	-
	Low	4	18	0.60	0.14 - 2.66
	High (3+ /yr)	2	14	0.40	0.07 - 2.22
Pest strips used at home during childhood	No	12	48	1.0	-
	Yes	0	4	0	-
Oil based paints, thinner, brush cleaner or strippers used at home during childhood	No	8	31	1.0	-
	Yes	4	21	0.61	0.15 - 2.53
Car repair at home during childhood	No	8	32	1.0	-
	Yes	4	20	0.70	0.19 - 2.64

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<b>Exposure Factor</b>	<b>Exposure Level</b>	<b>Number of Cases</b>	<b>Number of Controls</b>	<b>Odds Ratio</b>	<b>95% Confidence Interval</b>
Average annual frequency of car repairs at home during childhood	None	8	32	1.0	-
	Low	2	8	0.87	0.15 - 4.92
	High (4+ /yr)	2	12	0.60	0.12 - 3.11
Fingernail polish or remover used at home during childhood	No	0	15	-	-
	Yes	12	37	-	-
Average monthly frequency of fingernail polish or remover used at home during childhood	None	0	15	-	-
	Low	6	15	-	-
	High(> 1/mo)	6	22	-	-
Moth balls or crystals used at home during childhood	No	8	44	1.0	-
	Yes	4	7	2.91	0.68 - 12.4
Wood cleaner or furniture polish used at home during childhood	No	0	2	-	-
	Yes	12	50	-	-
Average weekly use of wood cleaner or furniture polish at home during childhood	None/Low	12	43	1.0	-
	High (> 1/wk)	0	9	0	-
Child lived on a farm	No	12	51	1.0	-
	Yes	0	1	0	-
Child was regularly around cows, pigs, or horses	No	12	48	1.0	-
	Yes	0	4	0	-
Child was regularly around chickens, geese, or ducks	No	11	45	1.0	-
	Yes	1	7	0.52	0.06 - 4.80
Child lived with a pet	No	2	8	1.0	-
	Yes	10	44	0.62	0.12 - 3.22

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<b>Exposure Factor</b>	<b>Exposure Level</b>	<b>Number of Cases</b>	<b>Number of Controls</b>	<b>Odds Ratio</b>	<b>95% Confidence Interval</b>
Child lived with a dog	No	4	16	1.0	-
	Yes	8	36	0.67	0.17 - 2.59
Child lived with a cat	No	9	27	1.0	-
	Yes	3	25	0.31	0.07 - 1.28
Child lived with a pet other than a dog or cat	No	8	26	1.0	-
	Yes	4	26	0.43	0.11 - 1.66
Child lived with a pet who wore flea collars	No	4	21	1.0	-
	Yes	8	30	1.11	0.31 - 3.97
Child regularly used an electric blanket or mattress pad	No	12	49	1.0	-
	Yes	0	3	0	-
Child regularly used a heated water bed	No	11	50	1.0	-
	Yes	1	2	2.45	0.14 - 42.6
Child regularly used an electric blanket, mattress pad, or heated water bed	No	11	47	1.0	-
	Yes	1	5	0.77	0.07 - 7.76
<b>Prenatal Exposure: Brain and Central Nervous System Cancer Diagnosis Ages 0 through 4</b>					
Pesticides indoors at home during pregnancy	No	3	14	1.0	-
	Yes	0	2	0	-
Pesticides or herbicides used outdoors during pregnancy	No	2	10	1.0	-
	Yes	1	6	0.56	0.05 - 6.44
Pest strips used at home during pregnancy	No	3	15	1.0	-
	Yes	0	1	0	-
Flea collars used on pets at home during pregnancy	No	1	7	1.0	-
	Yes	2	8	0.61	0.03 - 13.0

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<b>Exposure Factor</b>	<b>Exposure Level</b>	<b>Number of Cases</b>	<b>Number of Controls</b>	<b>Odds Ratio</b>	<b>95% Confidence Interval</b>
Oil based paint, paint thinners, brush cleaners or furniture strippers used at home during pregnancy	No Yes	2 1	11 5	1.0 0.72	- 0.06 - 9.12
Car repair at home during pregnancy	No Yes	3 0	11 5	1.0 0	- -
Fingernail polish or remover used at home during pregnancy	No Yes	0 3	4 12	- -	- -
Moth balls or moth crystals used at home during pregnancy	No Yes	3 0	14 1	1.0 0	- -
Wood cleaner or furniture polish used at home	No Yes	0 3	2 14	0 0	- -
Mother regularly used electric blanket or electric mattress pad during pregnancy	No Yes	2 1	15 1	1.0 4.00	- 0.25 - 64.0
Mother regularly used heated water bed during pregnancy	No Yes	3 0	14 2	1.0 0	- -
Mother regularly used electric blanket, electric mattress pad, or heated water bed during pregnancy	No Yes	2 1	13 3	1.0 2.00	- 0.18 - 22.1
<b>Postnatal Exposure: Brain and Central Nervous System Cancer Diagnosis Ages 0 through 4</b>					
Pesticides used indoors at home during childhood	No Yes	3 0	14 2	1.0 0	- -
Pesticides or herbicides used outdoors during childhood	No Yes	1 2	9 7	1.0 1.38	- 0.11 - 17.4

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<b>Exposure Factor</b>	<b>Exposure Level</b>	<b>Number of Cases</b>	<b>Number of Controls</b>	<b>Odds Ratio</b>	<b>95% Confidence Interval</b>
Average annual frequency of use yard or garden treatments during childhood	None	1	9	-	-
	Low	2	2	-	-
	High (3+ /yr)	0	5	-	-
Pest strips were used at home during childhood	No	3	15	1.0	-
	Yes	0	1	0	-
Oil based paints, thinner, brush cleaner or strippers used at home during childhood	No	3	10	1.0	-
	Yes	0	6	0	-
Car repair at home during childhood	No	3	11	1.0	-
	Yes	0	5	0	-
Average annual frequency of car repairs at home during childhood	None	3	11	1.0	-
	Low	0	0	-	-
	High (4+ /yr)	0	5	0	-
Fingernail polish or remover used at home during childhood	No	0	5	-	-
	Yes	3	11	-	-
Average monthly frequency of fingernail polish or remover used at home during childhood	None	0	5	-	-
	Low	2	6	-	-
	High (> 1/mo)	1	5	-	-
Moth balls or crystals used at home during childhood	No	3	14	1.0	-
	Yes	0	1	0	-
Wood cleaner or furniture polish used at home during childhood	No	0	2	-	-
	Yes	3	14	-	-
Average weekly use of wood cleaner or furniture polish at home during childhood	None/Low	3	14	1.0	-
	High (> 1/wk)	0	2	0	-

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<b>Exposure Factor</b>	<b>Exposure Level</b>	<b>Number of Cases</b>	<b>Number of Controls</b>	<b>Odds Ratio</b>	<b>95% Confidence Interval</b>
Child lived on a farm	No Yes	3 0	16 0	1.0 -	- -
Child was regularly around cows, pigs, or horses	No Yes	3 0	15 1	1.0 0	- -
Child was regularly around chickens, geese, or ducks	No Yes	3 0	14 2	1.0 0	- -
Child lived with a pet	No Yes	2 1	4 12	1.0 0.12	- 0.01 - 1.38
Child lived with a dog	No Yes	2 1	6 10	1.0 0.17	- 0.01 - 1.93
Child lived with a cat	No Yes	2 1	12 4	1.0 1.00	- 0.03 - 32.0
Child lived with a pet other than a dog or a cat	No Yes	3 0	13 3	1.0 0	- -
Child lived with a pet who wore flea collars	No Yes	2 1	7 8	1.0 0.22	- 0.02 - 2.78
Child regularly used an electric blanket or mattress pad	No Yes	3 0	15 1	1.0 0	- -
Child regularly used a heated water bed	No Yes	3 0	16 0	1.0 -	- -
Child regularly used an electric blanket, mattress pad, or heated water bed	No Yes	3 0	15 1	1.0 0	- -

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**Table 16. Comparison of Controls Lost to Follow-up and Interview Study Controls**

<b>Characteristic</b>	<b>Lost to Follow-up (n=39)</b>		<b>Interview Study (n=159)</b>	
	<b>Number</b>	<b>Percent</b>	<b>Number</b>	<b>Percent</b>
<b>Race:</b>				
White	31	79.5	154	96.9
Non-white	1	2.6	5	3.1
Unknown	7	17.9	0	0
<b>Maternal residence in Dover Township at child's birth:</b>				
Yes	9	23.1	84	52.8
No	28	71.8	73	45.9
Unknown	2	5.1	2	1.3
<b>Mean year of birth</b>	1976		1980	
<b>Mean maternal age at child's birth</b>	26		27	
<b>Child was first live birth of mother:</b>				
Yes	8	20.5	65	40.9
No	24	61.5	91	57.2
Unknown	7	18.0	3	1.9
<b>Mean birth weight in grams</b>	3361		3352	

**Table 17. Interview Study Case School Status at Time Matched Controls were Selected: Children Diagnosed Under Age 6**

<b>Case School Status at Toms River School District when Matched Controls were Selected (controls matched to projected first grade class of case)</b>	<b>Number of Cases</b>
Number of cases enrolled in Toms River School District along with their controls	11
Number of cases who died prior to entering first grade	3
Number of cases who could not be identified as being enrolled in the Toms River School District along with their controls	3
Total cases diagnosed prior to school age (<6) with controls selected from the Toms River School District	17

**Table 18. Birth Records Study Summary of Case Ascertainment**

<b>Residential Location at Time of Diagnosis: Dover Township Birth Cohort Subsequently Diagnosed with Cancer</b>	<b>Cases (n=48)</b>	
	<b>Number</b>	<b>Percent</b>
Dover Township, Ocean County	41	85.4
Ocean County, excluding Dover Township	5	10.4
New Jersey, excluding Ocean County	1	2.1
Outside of New Jersey	1	2.1

**Table 19. Birth Records Study Cases by Diagnosis Age and Cancer Type**

<b>Cancer Type</b>	<b>Age at Diagnosis</b>				<b>Total Cases by Type</b>	<b>Percent of All Cancers</b>
	<b>0 - 4</b>	<b>5 - 9</b>	<b>10 - 14</b>	<b>15 - 19</b>		
Leukemia	7	4	3	2	16	33.3
Sympathetic nervous system cancer	5	0	0	1	6	12.5
Brain and central nervous system cancer	4	0	1	2	7	14.6
All other cancers	7	1	5	6	19	39.6
<b>Total</b>	23	5	9	11	48	100.0



**Table 20. Birth Records Study Demographic, Pregnancy, and Birth Characteristics**

Characteristic	Cases (n=48)		Controls (n=480)	
	Number	Percent	Number	Percent
<b>Gender of child:</b>				
Female	25	52.0	250	52.0
Male	23	48.0	230	48.0
<b>Year of birth of child:</b>				
1964 - 69	7	14.6	70	14.6
1970 - 74	5	10.4	50	10.4
1975 - 79	10	20.8	100	20.8
1980 - 84	14	29.2	130	29.2
1985 - 89	9	18.7	100	18.7
1990 - 96	3	6.3	30	6.3
<b>Year of case diagnosis:</b>				
1979 - 84	12	25.0		
1985 - 90	22	45.8		
1991 - 96	14	29.2		
<b>Race of child's mother:</b>				
White	48	100	467	97.3
Non-white	0	0	12	2.5
Unknown	0	0	1	0.2
<b>Mother's age at child's birth:</b>				
<20 years	3	6.3	39	8.1
20 - 34 years	41	85.4	403	84.0
>34 years	4	8.3	38	7.9
<b>Mother's educational level:</b>				
< 12 years	8	16.7	66	13.8
12-15 years	26	54.2	286	59.6
16+ years	9	18.8	84	17.5
Unknown	5	10.4	44	9.2
<b>Race of child's father:</b>				
White	47	97.9	450	93.8
Non-white	1	2.1	12	2.5
Unknown	0	0	18	3.8

Characteristic	Cases (n=48)		Controls (n=480)	
	Number	Percent	Number	Percent
<b>Father's age at child's birth:</b>				
< 20 years	1	2.1	13	2.7
20 - 34 years	37	77.1	363	75.6
> 34 years	10	20.8	88	18.3
Unknown	0	0	16	3.3
<b>Father's educational level:</b>				
< 12 years	6	12.5	51	10.6
12-15 years	28	58.3	239	49.8
16+ years	9	18.8	127	26.5
Unknown	5	10.4	63	13.1
<b>Number of mother's previous live births still living:</b>				
None	9	18.8	187	39.0
1 - 4	38	79.2	279	58.1
> 4	1	2.1	14	2.9
<b>Number of mother's previous live births now deceased:</b>				
None	47	97.9	468	97.5
1+	1	2.1	12	2.5
<b>Terminations (all causes) and stillborns of mother:</b>				
None	39	79.6	361	73.7
1+	6	12.2	89	18.2
Unknown	4	8.2	40	8.2
<b>Total number of known pregnancies of mother:</b>				
1	8	16.7	157	32.7
2 - 4	37	77.1	277	57.7
5+	3	6.3	46	9.6
<b>Any complications of pregnancy for this pregnancy:</b>				
Yes	11	22.9	84	17.5
No	33	68.8	349	72.7
Unknown	4	8.3	47	9.8

Characteristic	Cases (n=48)		Controls (n=480)	
	Number	Percent	Number	Percent
<b>Any complications of labor or delivery for this pregnancy:</b>				
Yes	10	20.8	126	26.3
No	34	70.8	307	64.0
Unknown	4	8.3	47	9.8
<b>Any abnormal conditions of child:</b>				
Yes	1	2.1	11	2.3
No	35	72.9	372	77.5
Unknown	12	25.0	97	20.2
<b>Any congenital malformations of child:</b>				
Yes	2	4.2	4	0.8
No	35	72.9	375	78.1
Unknown	11	22.9	101	21.0
<b>Adequacy of prenatal care utilization for this pregnancy:</b>				
Inadequate	2	4.2	50	10.4
Intermediate	16	33.3	111	23.1
Adequate	16	33.3	222	46.3
Adequate plus	10	20.8	53	11.0
Unknown	4	8.3	44	9.2
<b>Delivery method* of child:</b>				
Vaginal	5	10.4	46	9.6
C-section	1	2.1	14	2.9
Unknown	42	87.5	420	87.5
<b>Mother's weight gain* during this pregnancy:</b>				
<31 lbs	2	4.2	32	6.7
31+ lbs	3	6.3	22	4.6
Unknown	43	89.6	426	88.8
<b>Pregnancy duration of child:</b>				
< 37 weeks	4	8.3	26	5.4
37 - 44 weeks	42	87.5	445	92.7
> 44 weeks	2	4.2	7	1.5
Unknown	0	0	2	0.4

Characteristic	Cases (n=48)		Controls (n=480)	
	Number	Percent	Number	Percent
<b>Birth weight of child:</b>				
< 2500 grams	1	2.1	22	4.6
2500 - 3999 grams	38	79.2	400	83.3
> 3999 grams	9	18.8	58	12.1
<b>Child was first live birth of mother:</b>				
Yes	9	18.8	187	39.0
No	39	81.3	293	61.0
<b>Child's five minute Apgar*</b> <b>score:</b>				
Lower (0-7)	2	4.2	4	0.8
Higher (8+)	27	56.3	291	60.6
Unknown	19	39.6	185	38.5

\* **Note:** Information on weight gain, five minute Apgar, and delivery method was not collected on birth certificates until 1989 onward.

**Table 21a. Birth Records Study Analysis of Demographic, Pregnancy and Birth Characteristics:  
All Cancers Combined**

Exposure Factor	Exposure Level	Number of Cases	Number of Controls	Odds Ratio	95% Confidence Interval
<b>All Cancer Diagnosis Ages 0 through 19</b>					
Birth weight (grams) of child	2500-3999	38	400	1.0	-
	< 2500	1	22	0.47	0.06 - 3.67
	> 3999	9	58	1.60	0.75 - 3.44
Mother's age (years) at child's birth	20-34	41	403	1.0	-
	< 20	3	39	0.76	0.23 - 2.54
	> 34	4	38	1.04	0.35 - 3.08
Mother's educational level (years)	12-15	26	286	1.0	-
	< 12	8	66	1.31	0.55 - 3.12
	> 15	9	84	1.15	0.52 - 2.55
Father's age (years) at child's birth	20-34	37	363	1.0	-
	< 20	1	13	0.76	0.10 - 6.01
	> 34	10	88	1.13	0.54 - 2.37
Father's educational level (years)	12-15	28	239	1.0	-
	< 12	6	51	1.02	0.39 - 2.71
	> 15	9	127	0.58	0.27 - 1.29
Child was first live birth of mother	No	39	293	1.0	-
	Yes	9	187	0.35	0.16 - 0.75
Adequacy of prenatal care utilization for this pregnancy	Adequate	26	275	1.0	-
	Less than adequate	18	161	1.19	0.62 - 2.26

<b>Exposure Factor</b>	<b>Exposure Level</b>	<b>Number of Cases</b>	<b>Number of Controls</b>	<b>Odds Ratio</b>	<b>95% Confidence Interval</b>
Any complications of pregnancy for this pregnancy	No	33	349	1.0	-
	Yes	11	84	1.39	0.66 - 2.90
Any complications of labor or delivery for this pregnancy	No	34	307	1.0	-
	Yes	10	126	0.69	0.33 - 1.47
Any spontaneous or induced terminations of mother	No	39	361	1.0	-
	Yes	6	89	0.52	0.20 - 1.36
Any congenital malformations of child	No	35	375	1.0	-
	Yes	2	4	5.65	0.92 - 34.6
Any abnormal conditions of child	No	35	363	1.0	-
	Yes	1	11	0.80	0.10 - 6.59
<b>All Cancer Diagnosis Ages 0 through 4</b>					
Birth weight (grams) of child	2500-3999	17	189	1.0	-
	<2500	1	11	1.00	0.12 - 8.38
	>3999	5	30	1.81	0.64 - 5.15
Mother's age (years) at child's birth	20-34	18	192	1.0	-
	<20	2	17	1.24	0.27 - 5.75
	>34	3	21	1.52	0.41 - 5.59
Mother's educational level (years)	12-15	11	159	1.0	-
	<12	4	17	3.35	0.92 - 12.2
	>15	7	52	1.90	0.69 - 5.24
Father's age (years) at child's birth	20-34	16	172	1.0	-
	<20	0	5	0	-
	>34	7	47	1.59	0.62 - 4.05

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<b>Exposure Factor</b>	<b>Exposure Level</b>	<b>Number of Cases</b>	<b>Number of Controls</b>	<b>Odds Ratio</b>	<b>95% Confidence Interval</b>
Father's educational level (years)	12-15	14	129	1.0	-
	<12	2	11	1.73	0.35 - 8.47
	>15	6	78	0.67	0.25 - 1.85
Child was first live birth of mother	No	17	125	1.0	-
	Yes	6	105	0.43	0.16 - 1.11
Adequacy of prenatal care utilization for this pregnancy	Adequate	13	146	1.0	-
	Less than adequate	10	80	1.41	0.58 - 3.43
Any complications of pregnancy for this pregnancy	No	16	189	1.0	-
	Yes	7	38	2.15	0.83 - 5.54
Any complications of labor or delivery for this pregnancy	No	16	151	1.0	-
	Yes	7	76	0.86	0.33 - 2.22
Any spontaneous or induced terminations of mother	No	19	178	1.0	-
	Yes	4	52	0.72	0.23 - 2.21
Any congenital malformations of child	No	20	219	1.0	-
	Yes	2	4	5.65	0.92 - 34.6
Any abnormal conditions of child	No	21	215	1.0	-
	Yes	0	3	0	-

**Table 21b. Birth Records Study Analysis of Demographic, Pregnancy and Birth Characteristics: Leukemia**

Exposure Factor	Exposure Level	Number of Cases	Number of Controls	Odds Ratio	95% Confidence Interval
<b>Leukemia Diagnosis Ages 0 through 19</b>					
Birth weight (grams) of child	2500-3999	12	126	1.0	-
	<2500	0	14	0	-
	>3999	4	20	1.97	0.60 - 6.41
Mother's age (years) at child's birth	20-34	13	137	1.0	-
	<20	3	12	2.48	0.66 -9.34
	>34	0	11	0	-
Mother's educational level (years)	12-15	9	96	1.0	-
	<12	4	19	2.26	0.62 - 8.22
	>15	1	25	0.42	0.05 - 3.51
Father's age (years) at child's birth	20-34	14	119	1.0	-
	<20	1	6	1.46	0.17 - 12.8
	>34	1	28	0.30	0.04 - 2.37
Father's educational level (years)	12-15	9	96	1.0	-
	<12	4	19	1.22	0.24 - 6.10
	>15	1	25	0.36	0.07 - 1.74
Child was first live birth of mother	No	12	96	1.0	-
	Yes	4	64	0.50	0.15 - 1.62
Adequacy of prenatal care utilization for this pregnancy	Adequate	5	92	1.0	-
	Less than adequate	9	47	3.81	1.16 - 12.5
Any complications of pregnancy for this pregnancy	No	11	112	1.0	-
	Yes	3	25	1.21	0.32 - 4.62



Exposure Factor	Exposure Level	Number of Cases	Number of Controls	Odds Ratio	95% Confidence Interval
Any complications of labor or delivery for this pregnancy	No	9	90	1.0	-
	Yes	5	47	1.05	0.33 - 3.37
Any spontaneous or induced terminations of mother	No	14	117	1.0	-
	Yes	1	33	0.25	0.03 - 2.00
Any congenital malformations of child	No	11	123	1.0	-
	Yes	1	0	-	-
Any abnormal conditions of child	No	12	117	1.0	-
	Yes	0	5	0	-
<b>Leukemia Diagnosis Ages 0 through 4</b>					
Birth weight (grams) of child	2500-3999	4	57	1.0	-
	<2500	0	6	0	-
	>3999	3	7	5.66	1.07 - 29.9
Mother's age (years) at child's birth	20-34	5	61	1.0	-
	<20	2	5	4.16	0.74 - 23.3
	>34	0	4	0	-
Mother's educational level (years)	12-15	3	50	1.0	-
	<12	3	6	8.33	1.23 - 56.6
	>15	1	14	1.21	0.10 - 14.7
Father's age (years) at child's birth	20-34	6	51	1.0	-
	<20	0	3	0	-
	>34	1	13	0.64	0.07 - 5.86
Father's educational level (years)	12-15	4	41	1.0	-
	<12	2	2	7.39	0.98 - 55.8
	>15	1	22	0.43	0.04 - 4.32

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<b>Exposure Factor</b>	<b>Exposure Level</b>	<b>Number of Cases</b>	<b>Number of Controls</b>	<b>Odds Ratio</b>	<b>95% Confidence Interval</b>
Child was first live birth of mother	No	5	33	1.0	-
	Yes	2	37	0.37	0.07 - 1.99
Adequacy of prenatal care utilization for this pregnancy	Adequate	1	48	1.0	-
	Less than adequate	6	20	16.3	1.75 - 152
Any complications of pregnancy for this pregnancy	No	5	51	1.0	-
	Yes	2	16	1.28	0.23 - 7.21
Any complications of labor or delivery for this pregnancy	No	4	41	1.0	-
	Yes	3	26	1.17	0.24 - 5.61
Any spontaneous or induced terminations of mother	No	6	55	1.0	-
	Yes	1	15	0.60	0.07 - 5.53
Any congenital malformations of child	No	6	70	1.0	-
	Yes	1	0	-	-
Any abnormal conditions of child	No	7	67	1.0	-
	Yes	0	2	0	-

**Table 21c. Birth Records Study Analysis of Demographic, Pregnancy and Birth Characteristics:  
Nervous System Cancers**

Exposure Factor	Exposure Level	Number of Cases	Number of Controls	Odds Ratio	95% Confidence Interval
<b>Nervous System Cancer Diagnosis Ages 0 through 19</b>					
Birth weight (grams) of child	2500-3999	10	111	1.0	-
	<2500	1	1	10.3	0.64 - 167
	>3999	2	18	1.22	0.26 - 5.73
Mother's age (years) at child's birth	20-34	11	105	1.0	-
	<20	0	9	0	-
	>34	2	16	1.24	0.25 - 6.15
Mother's educational level (years)	12-15	6	80	1.0	-
	<12	1	18	0.41	0.29 - 5.86
	>15	5	30	2.03	0.60 - 6.88
Father's age (years) at child's birth	20-34	10	98	1.0	-
	<20	0	2	0	-
	>34	3	28	1.07	0.28 - 4.17
Father's educational level (years)	12-15	6	65	1.0	-
	<12	2	19	1.08	0.17 - 6.86
	>15	4	42	0.99	0.27 - 3.65
Child was first live birth of mother	No	10	78	1.0	-
	Yes	3	52	0.44	0.11 - 1.71
Adequacy of prenatal care utilization for this pregnancy	Adequate	12	79	1.0	-
	Less than adequate	1	49	0.12	0.01 - 0.95

<b>Exposure Factor</b>	<b>Exposure Level</b>	<b>Number of Cases</b>	<b>Number of Controls</b>	<b>Odds Ratio</b>	<b>95% Confidence Interval</b>
Any complications of pregnancy for this pregnancy	No	8	108	1.0	-
	Yes	5	21	3.21	0.96 - 10.7
Any complications of labor or delivery for this pregnancy	No	10	92	1.0	-
	Yes	3	37	0.73	0.18 - 2.94
Any spontaneous or induced terminations of mother	No	12	104	1.0	-
	Yes	1	26	0.33	0.04 - 2.66
Any congenital malformations of child	No	12	112	1.0	-
	Yes	0	3	0	-
Any abnormal conditions of child	No	11	107	1.0	-
	Yes	1	3	3.20	0.28 - 36.7
<b>Nervous System Cancer Diagnosis Ages 0 through 4</b>					
Birth weight (grams) of child	2500-3999	7	76	1.0	-
	< 2500	1	1	9.77	0.60 - 158
	> 3999	1	13	0.85	0.10 - 7.09
Mother's age (years) at child's birth	20-34	7	76	1.0	-
	< 20	0	4	0	-
	> 34	2	10	2.24	0.40 - 12.4
Mother's educational level (years)	12-15	4	62	1.0	-
	< 12	0	3	0	-
	> 15	4	24	2.18	0.54 - 8.84
Father's age (years) at child's birth	20-34	6	71	1.0	-
	< 20	0	0	-	-
	> 34	3	19	1.83	0.43 - 7.83

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<b>Exposure Factor</b>	<b>Exposure Level</b>	<b>Number of Cases</b>	<b>Number of Controls</b>	<b>Odds Ratio</b>	<b>95% Confidence Interval</b>
Father's educational level (years)	12-15	5	49	1.0	-
	<12	0	5	0	-
	>15	3	34	0.85	0.19 - 3.71
Child was first live birth of mother	No	6	54	1.0	-
	Yes	3	36	0.76	0.18 - 3.14
Adequacy of prenatal care utilization for this pregnancy	Adequate	9	55	1.0	-
	Less than adequate	0	33	0	-
Any complications of pregnancy for this pregnancy	No	5	79	1.0	-
	Yes	4	11	4.94	1.26 - 19.4
Any complications of labor or delivery for this pregnancy	No	6	61	1.0	-
	Yes	3	29	1.06	0.24 - 4.72
Any spontaneous or induced terminations of mother	No	8	70	1.0	-
	Yes	1	20	0.43	0.05 - 3.70
Any congenital malformations of child	No	9	87	1.0	-
	Yes	0	3	0	-
Any abnormal conditions of child	No	9	84	1.0	-
	Yes	0	1	0	-

**Table 21d. Birth Records Study Analysis of Demographic, Pregnancy and Birth Characteristics:  
Brain and Central Nervous System Cancers**

Exposure Factor	Exposure Level	Number of Cases	Number of Controls	Odds Ratio	95% Confidence Interval
<b>Brain and Central Nervous System Cancer Diagnosis Ages 0 through 19</b>					
Birth weight (grams) in child	2500-3999	5	63	1.0	-
	<2500	1	0	-	-
	>3999	1	7	1.73	0.19 - 16.0
Mother's age (years) at child's birth	20-34	7	55	1.0	-
	<20	0	6	0	-
	>34	0	9	0	-
Mother's educational level (years)	12-15	4	43	1.0	-
	<12	0	14	0	-
	>15	2	13	1.81	0.29 - 11.33
Father's age (years) at child's birth	20-34	7	51	1.0	-
	<20	0	2	0	-
	>34	0	16	0	-
Father's educational level (years)	12-15	3	36	1.0	-
	<12	1	12	0.83	0.06 - 11.7
	>15	2	20	1.14	0.18 - 7.35
Child was first live birth on mother	No	5	44	1.0	-
	Yes	2	26	0.67	0.12 - 3.80
Adequacy of prenatal care utilization for this pregnancy	Adequate	6	37	1.0	-
	Less than adequate	1	32	0.20	0.02 - 1.74

<b>Exposure Factor</b>	<b>Exposure Level</b>	<b>Number of Cases</b>	<b>Number of Controls</b>	<b>Odds Ratio</b>	<b>95% Confidence Interval</b>
Any complications of pregnancy for this pregnancy	No	4	56	1.0	-
	Yes	3	13	3.36	0.66 - 17.2
Any complications of labor or delivery for this pregnancy	No	9	90	1.0	-
	Yes	5	47	1.14	0.21 - 6.28
Any spontaneous or induced terminations of mother	No	6	56	1.0	-
	Yes	1	14	0.66	0.07 - 6.11
Any congenital malformations of child	No	7	60	1.0	-
	Yes	0	2	0	-
Any abnormal conditions of child	No	6	60	1.0	-
	Yes	1	2	5.29	0.32 - 86.9
<b>Brain and Central Nervous System Cancer Diagnosis Ages 0 through 4</b>					
Birth weight (grams) of child	2500-3999	3	36	1.0	-
	<2500	1	0	-	-
	>3999	0	4	0	-
Mother's age (years) at child's birth	20-34	4	34	1.0	-
	<20	0	2	0	-
	>34	0	4	0	-
Mother's educational level (years)	12-15	2	30	1.0	-
	<12	0	0	-	-
	>15	1	10	1.15	0.10 - 12.8
Father's age (years) at child's birth	20-34	4	33	1.0	-
	<20	0	0	-	-
	>34	0	7	0	-

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<b>Exposure Factor</b>	<b>Exposure Level</b>	<b>Number of Cases</b>	<b>Number of Controls</b>	<b>Odds Ratio</b>	<b>95% Confidence Interval</b>
Father's educational level (years)	12-15	2	22	1.0	-
	<12	0	1	0	-
	>15	1	16	0.59	0.05 - 6.70
Child was first live birth of mother	No	2	22	1.0	-
	Yes	2	18	1.22	0.16 - 9.25
Adequacy of prenatal care utilization for this pregnancy	Adequate	4	23	1.0	-
	Less than adequate	0	16	0	-
Any complications of pregnancy for this pregnancy	No	2	36	1.0	-
	Yes	2	4	6.71	0.91 - 49.5
Any complications of labor or delivery for this pregnancy	No	2	29	1.0	-
	Yes	2	11	2.56	0.33 - 19.7
Any spontaneous or induced terminations of mother	No	3	32	1.0	-
	Yes	1	8	1.39	0.11 - 18.2
Any congenital malformations of child	No	4	38	1.0	-
	Yes	0	2	0	-
Any abnormal conditions of child	No	4	40	1.0	-
	Yes	0	0	-	-



**Table 21e. Birth Records Study Analysis of Demographic, Pregnancy and Birth Characteristics:  
All Other Cancers**

Exposure Factor	Exposure Level	Number of Cases	Number of Controls	Odds Ratio	95% Confidence Interval
<b>All Other Cancer Diagnosis Ages 0 through 19</b>					
Birth weight (grams) of child	2500-3999	16	163	1.0	-
	<2500	0	7	0	-
	>3999	3	20	1.56	0.41 - 5.98
Mother's age (years) at child's birth	20-34	17	161	1.0	-
	<20	0	18	0	-
	>34	2	11	1.77	0.35 - 8.91
Mother's educational level (years)	12-15	11	110	1.0	-
	<12	3	29	1.03	0.27 - 3.93
	>15	3	29	1.04	0.27 - 3.99
Father's age (years) at child's birth	20-34	13	98	1.0	-
	<20	0	2	0	-
	>34	6	32	2.19	0.76 - 6.35
Father's educational level (years)	12-15	12	97	1.0	-
	<12	2	19	0.85	0.17 - 4.25
	>15	3	44	0.52	0.14 - 2.00
Child was first live birth of mother	No	17	119	1.0	-
	Yes	2	71	0.18	0.04 - 0.83
Adequacy of prenatal care utilization for this pregnancy	Adequate	9	104	1.0	-
	Less than adequate	8	65	1.41	0.53 - 3.75

<b>Exposure Factor</b>	<b>Exposure Level</b>	<b>Number of Cases</b>	<b>Number of Controls</b>	<b>Odds Ratio</b>	<b>95% Confidence Interval</b>
Any complications of pregnancy for this pregnancy	No	14	129	1.0	-
	Yes	3	38	0.71	0.19 - 2.70
Any complications of labor or delivery for this pregnancy	No	15	125	1.0	-
	Yes	2	43	0.37	0.08 - 1.73
Any spontaneous or induced terminations of mother	No	14	144	1.0	-
	Yes	3	28	1.09	0.30 - 3.99
Any congenital malformations of child	No	12	140	1.0	-
	Yes	1	1	0	-
Any abnormal conditions of child	No	12	139	1.0	-
	Yes	0	3	0	-
<b>All Other Cancer Diagnosis Ages 0 through 4</b>					
Birth weight (grams) of child	2500-3999	6	56	1.0	-
	<2500	0	4	0	-
	>3999	1	10	0.93	0.10 - 8.62
Mother's age (years) at child's birth	20-34	6	55	1.0	-
	<20	0	8	0	-
	>34	1	7	1.32	0.15 - 12.1
Mother's educational level (years)	12-15	4	47	1.0	-
	<12	1	8	1.59	0.14 - 18.4
	>15	2	14	1.74	0.27 - 11.1
Father's age (years) at child's birth	20-34	4	50	1.0	-
	<20	0	2	0	-
	>34	3	15	2.41	0.51 - 11.3

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<b>Exposure Factor</b>	<b>Exposure Level</b>	<b>Number of Cases</b>	<b>Number of Controls</b>	<b>Odds Ratio</b>	<b>95% Confidence Interval</b>
Father's educational level (years)	12-15	5	39	1.0	-
	<12	0	4	0	-
	>15	2	22	0.66	0.11 - 3.86
Child was first live birth of mother	No	6	38	1.0	-
	Yes	1	32	0.19	0.02 - 1.72
Adequacy of prenatal care utilization for this pregnancy	Adequate	3	43	1.0	-
	Less than adequate	4	27	2.07	0.44 - 9.72
Any complications of pregnancy for this pregnancy	No	6	59	1.0	-
	Yes	1	11	0.89	0.10 - 8.10
Any complications of labor or delivery for this pregnancy	No	6	49	1.0	-
	Yes	1	21	0.36	0.04 - 3.41
Any spontaneous or induced terminations of mother	No	5	53	1.0	-
	Yes	2	17	1.23	0.23 - 6.65
Any congenital malformations of child	No	5	62	1.0	-
	Yes	1	1	0	-
Any abnormal conditions of child	No	5	64	1.0	-
	Yes	0	0	-	-

**Table 22. Birth Records Study Exposure to Tobacco Smoke and Alcohol**

<b>Characteristic</b>	<b>Cases (n=48)</b>		<b>Controls (n=480)</b>	
	<b>Number</b>	<b>Percent</b>	<b>Number</b>	<b>Percent</b>
<b>Mother who used tobacco*</b> <b>during pregnancy:</b>				
Yes	1	2.1	5	1.0
No	4	8.3	52	10.8
Unknown	43	89.6	423	88.1
<b>Mother's who consumed any</b> <b>alcohol* during pregnancy:</b>				
Yes	0	0	0	0
No	5	10.4	58	12.1
Unknown	43	89.6	422	87.9

\* **Note:** Information on tobacco and alcohol use was not collected on birth certificates until 1989 onward.

